NORTHERN
ECOLOGICAL
SERVICES

ANNUAL REPORT
BRADLEY RIVER SALMON STUDY PROGRAM

Prepared for:

ALASKA ENERGY AUTHORITY

December 1998

ward Highway, Suite 206 • Anchorage, Alaska 99518 • Phone / Fax (907) 561-7252

ANNUAL REPORT

BRADLEY RIVER SALMON STUDY PROGRAM - 1998

By

John W. Morsell

Northern Ecological Services
Anchorage, Alaska

Prepared for

Alaska Energy Authority
Anchorage, Alaska

December 1998

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

The Federal Energy Regulatory Commission (FERC) license granted to the Alaska Power Authority (now Alaska Energy Authority) for the Bradley Lake Hydroelectric Project (Project No. 8221) stipulated that a plan be developed and implemented to monitor the abundance of salmon in the Bradley River. Studies per the approved monitoring plan (Alaska Power Authority 1986a) were conducted from 1986 through 1995 with the intent of providing a yearly index of salmon abundance during both the pre-operational and post-operational periods to allow an appraisal of project impacts to salmon resources of the Bradley River. Additionally, a study of salmon attraction to the powerhouse discharge (tailrace) was initiated in 1992 and completed in 1993. The results of these studies are reported in annual reports for the above years. A summary of the study results from 1986-1995 is included in the 1995 Final Report (Alaska Energy Authority 1995).

Submittal of the 1995 Final Report constituted completion of the required fisheries monitoring per the FERC license. However, the Alaska Energy Authority elected to continue the salmon escapement monitoring program for an additional three years to provide a longer period of record and better establish salmon population trends in the Bradley River during the operational regime. This report presents the results of the third and final year of investigation under the extended study program.

Operation of the Bradley Lake Hydroelectric Project began in the fall of 1991, consequently 1992 was the first full year of project operation. However, operational flows were in effect during the summer of 1991 while the reservoir was filling. Therefore, 1998 was the eighth year of the study to examine the salmon resources under the operational flow regime.

The salmon resources of the Bradley River have been documented in considerable detail through a series of studies beginning with early permit-related investigations (USFWS 1982; Woodward-Clyde Consultants 1983, 1984; Northern Technical Services 1985) and continuing with the 1986-1995 FERC mandated monitoring program. The Bradley River is a turbid stream of glacial origin, consequently fish cannot normally be visually detected. Various active and passive sampling techniques have been utilized to gain insight into fish populations. The results of these studies have indicated that pink salmon (Oncorhynchus gorbuscha) is the principal salmon species using the river for spawning, although smaller numbers of chum (O. keta), coho (O. kisutch), sockeye (O. nerka) and chinook (O. tshawytscha) also utilize the river. Potential spawning habitat is limited to a short segment of the river due to high gradient and coarse substrate at the upstream end and silty tideflats at the lower end. Pink salmon were identified early in the permit process as the key evaluation species, consequently all study efforts have emphasized this species.

OBJECTIVES

The primary objectives of the 1998 field effort were to:

- Continue monitoring the escapement of salmon to the Bradley River to extend the period of record and provide a better indication of trends in salmon reproduction under the regulated flow regime.

- Continue the general assessment of the habitat value of the river under the operational flow regime as compared to the pre-operational flow regime

- Gain additional insight into the effects on fish populations as flows are fine-tuned closer to allowable minimums

- Maximize the amount of biological information obtained from the study by thoroughly analyzing the data.

METHODS

Study methodology in 1998 was essentially identical to that used in prior years so that catch and population data would be comparable. The study period was shortened from 9 weeks to 8 weeks under the extended study program starting in 1996 to reduce costs while still encompassing the full pink salmon spawning period.

Study Area

The primary study area consisted of an approximately 2,300-m (7,500-ft) stream segment extending from the downstream end of Riffle Reach to waterfalls above the upstream end of Bear Island Slough (Figure 1). The study area encompasses almost all of the known spawning habitat in the Bradley River system.

One study site was located outside of the primary study area. Fox Farm Creek, a small clear-water tributary to the Bradley River at RM 2.5, was monitored for salmon escapement (Figure 1).

Study Duration

The study was conducted over an 8 week period from July 21 through September 10. The general timing of the study was originally selected to coincide with the duration and timing of the pink salmon run, based on the results of the earlier studies and confirmed in recent years.

Under the normal schedule of sampling, the field crew traveled to the site on Monday evening of each calendar week and intensive sampling took place on Tuesday, Wednesday and Thursday.

Trap Net Sampling

Trap nets were again used as the primary sampling technique as in the 1986-1997 efforts. The standard project trap nets as redesigned in 1990 (see Alaska Energy Authority 1990) were designed to fish in water as shallow as 0.5 m and proved to work well at selected deeper sites in

the river. Net design is illustrated in Figure 2. These nets were made from 6.35 cm (2.5 inch) stretch mesh nylon. Net wings were attached to the main frame of the net in various configurations depending on the location of the net in the river.

The 6 trap net sites established in 1991 for the operational flow regime were utilized again in 1998 (Figure 3). For the most part, there was no indication that significant stream channel changes had occurred since the 1991 season, consequently the conditions at most net locations effectively duplicated the conditions present during the 1991 through 1997 studies. Nets 1 and 5A were moved slightly in 1998 to accommodate minor changes. Some of the nets were accessible by boat and some were only accessible by foot.

During each typical weekly sampling period, the trap nets in the primary study area were set Tuesday morning and fished until Thursday morning for a total of approximately 48 hours, after which they were removed from the water until the following week. During normal operations, each net was checked every 4 hours during the daytime and then allowed to fish overnight. Adverse weather conditions in Weeks 5 and 7 caused the net set time to be delayed until Tuesday afternoon; during these weeks the nets were retrieved on Thursday afternoon so that the set time remained at about 24 hours. Some additional variation in the typical sampling regime occurred because of the difficulty accessing nets during extreme high tides. Sampling times were delayed by 1-2 hours during those days when unusually high tides coincided with scheduled sampling times.

During normal operating procedures, fish were removed from the nets at each check, identified to species, measured, and salmon species were tagged using sequentially numbered Floy spaghetti tags. Larger Dolly Varden were marked by punching a hole in the upper lobe of the caudal fin. Sex and spawning condition were recorded for all salmon. Spawning condition codes were as follows:

Code	Condition
1	Fresh, non-spawning coloration, silvery
2	Spawning coloration, not ripe
3	Ripe, eggs or milt readily stripped
4	Spawned out
5	Visible deterioration
6	Dead

Beach Seine Sampling

Beach seining was used as a supplemental sampling method. Seine sites are indicated on Figure 3. Sites S1 and S3 were seined consistently during Weeks 3-8. No seining was conducted in Weeks 1 and 2 because of the large number of chinook salmon spawning in seine areas. In most cases two hauls were made at each site. The seine utilized was 100 ft. long by 6 ft. deep, constructed of 2.5 in. stretch mesh netting. Captured fish were processed in a manner similar to that described for the trap net sampling.

Carcass Counts

All salmon carcasses observed within the study area were counted and tags were noted.

Fox Farm Creek Surveys

Visual surveys of fish present in Fox Farm Creek, a clear tributary to the Bradley River (Figure 1), were conducted once during each sample week. Observers walked the entire habitable length of the creek at lower tide levels and recorded the numbers of fish present for each species of salmon and the numbers of fish showing visible project tags.

Biological Data Management

Data from field data books were entered into a computer spreadsheet using an IBM compatible microcomputer. Printouts from the spreadsheets were checked by field personnel against the field notebooks. The spreadsheets were edited, correcting any observed errors.

Population and Escapement Estimation

The principal methods used for estimating populations were the same as those used in past years to assure comparability of data. Population estimates based on trap net catches were calculated for the primary species of salmon present during each sample week using the Peterson mark and recapture model, as modified by Chapman (Ricker 1975). The following assumptions were used in constructing the model:

1. Salmon numbers remained constant during the 3-day sample period.

2. All fish marked during the previous 2 sample weeks were still present in the study area.

3. Fish marked 3 or more weeks prior to the sample week were no longer present in the study area.

4. Marked and unmarked fish were equally susceptible to capture.

Physical Data Collection

Air temperature, water temperature, turbidity, and stream stage were recorded daily at the field camp (Figure 1) on those days that the study crew was in the field. Turbidity was measured in the field using an HF Instruments Model DRT15 nephelometric turbidity meter. Stream stage was measured using a staff gage. The gage measurements were strictly relative and were not tied to any datum.

Miscellaneous Observations

Wildlife presence and other events of ecological interest were noted as they occurred.

RESULTS

Overall Catch

Overall catch for all methods combined is summarized by week in Table 1. Complete catch records for all fish are presented in Appendix A.

As in past years, all five species of Pacific salmon indigenous to Alaska were captured in the Bradley River. Pink salmon were the most abundant species with a total catch of 216 fish. Smaller numbers of chum (34 fish), coho (30 fish), sockeye (107 fish), and chinook (118 fish) salmon also were caught. In addition, 126 Dolly Varden (Salvelinus malma) were collected.

Trap Net Index Sampling

Trap nets were the primary sampling technique and proved to be effective at catching adult salmon. The sampling effort for the 6 index nets was uniform throughout the study period. Trap net fishing times for each net and week are summarized in Appendix B.

Pink salmon catch and catch-per-hour for each week are presented in Table 2 and weekly catch-per-hour is summarized in Figure 4. The catch-per-hour was generally low throughout the study period with peaks occurring in Week 5 (August 18-20) and Week 8 (September 8-10). In contrast to prior years, the weekly catch rate was inconsistent with no obvious single period of peak abundance. The maximum catch rate was reached in Week 8 at 0.11 fish per hour (Table 2).

Chum salmon catch was highest during the late July to early August period then declined precipitously in mid-August (Table 2 and Figure 5). The maximum catch rate occurred during the third week of the study at 0.04 fish per hour (Table 2).

Coho salmon (Table 2 and Figure 6) were first seen in the study area during Week 2 with larger numbers appearing in mid-August. Small numbers of fish were present through the end of the study period. The highest catch rate occurred during Week 4.

Sockeye salmon were present in the Bradley River during most of the study period (Table 2 and Figure 7). Sockeyes began entering the study area in late July, building to a peak of abundance in mid-August, and then gradually decreasing in numbers through the end of the study period.

Chinook salmon were present in significant numbers during Week 1 and declined rapidly thereafter (Table 2 and Figure 8). Chinooks were the most abundant salmon species during Week 1 with a catch of 0.27 fish per hour.

Dolly Varden were collected in trap nets during all weeks of the study with greatest abundance occurring in late July and early August (Table 2 and Figure 9).

Beach Seining

Beach seine catch data are summarized for pink salmon in Table 3. A total of 97 pink salmon were caught by the beach seine in 1998, of which 11 were fish that had been tagged previously. Small numbers of the other salmon species as well as Dolly Varden were also caught in the seine.

Carcass Counts

The results of carcass counts are presented in Table 4. During the course of the 1998 study, 7 pink salmon carcasses, 3 chum salmon carcasses, 8 chinook salmon carcasses, and 3 sockeye salmon carcasses were observed in the study area.

Fish Condition

The condition codes for all measured salmon are presented in Appendix A-1. Condition 3, "ripe", is indicative of spawning condition and was the least subjective of the condition codes since it depended on the actual presence of eggs or milt. Figure 10 shows the percent frequency of occurrence of Condition 3 fish for both male and female pink salmon. After the first week of the study, most male pink salmon present in the study area were ripe. The percent frequency of ripe females increased gradually, reaching a peak of ripeness in Week 6 of the study (August 25-27), and decreased thereafter. A substantial number of females were still ripe in Week 8 and spawning undoubtedly continued to occur during the last week of the study. However, the overall condition of pink salmon in Week 8 was poor suggesting that the end of spawning was near. As has been the case in most prior years, male sexual maturity preceded the peak of female sexual maturity by several weeks.

All but two of the chum salmon caught during the study were either ripe or spawned out indicating that the study was initiated during the middle and later stages of the chum salmon spawning period. Very few chum salmon were present after Week 3.

Coho salmon were first observed in the Bradley River on July 30, however no ripe fish were seen until August 27 when one ripe male was observed. During the last three weeks of the study several ripe males were observed. No ripe females were observed during the study period. The peak of coho spawning likely occurred well after the end of the study period in late September or early October.

Moderate numbers of sockeyes were caught in the Bradley River starting in late July and continuing throughout the entire study period. Percentages of ripe fish in Weeks 2 through 8 were 50, 71, 55, 89, 73, 75, and 100, respectively, suggesting that spawning occurred over a prolonged period from early August to early September.

During the first week of the study, 92 percent of the chinooks caught were ripe and during the second week 71 percent were ripe. The number of chinooks present in the river decreased rapidly after Week 3. Most spawning probably occurred during mid- to late July, prior to and during the first two weeks of the study period.

Stream Life Duration

Table 5 provides information on the tagging history of all pink salmon recaptured in trap nets. The total catch and the number of tagged recaptures was small compared to most prior years; consequently, information obtained from recaptures was limited. The longest duration recorded in 1998 was a fish tagged on August 19 and recaptured on September 9, for a total known stream life of 22 days.

The timing of the study period did not include the early part of the chinook or chum salmon runs; consequently, information related to stream life is limited. Only 4 of 118 chinooks were recaptures and all were recaptured in the same week in which they had been tagged. Similarly, none of the chum salmon recaptures were known to have been in the river for greater than one week.

Sockeye salmon were present in the study area throughout most of the study period in 1998, and recapture records indicate that some individual fish had an extended freshwater residence. One fish was originally tagged on July 30 and recaptured on September 8 for a minimum stream duration of 41 days. Two other sockeyes were present in the river for at least one month.

Spawning Area Location

Relatively low turbidity during the first week of the study coincided with the probable peak of chinook salmon spawning and, thus, provided an unusual opportunity to observe chinook spawning locations. During a visual stream survey on July 21, 117 chinook salmon were observed within the study area. Nearly all of these fish appeared to be associated with redds and spawning was widely distributed as shown in Figure 11.

Fox Farm Creek Surveys

Salmon were only observed in Fox Farm Creek during Week 7. Two untagged pink salmon were seen in pool areas.

Population Estimates

Weekly population estimates for pink salmon based on trap net recaptures using mark and recapture techniques were not possible in 1998 because of the unusually small catch and the small number of recaptures (Table 5). Seine sampling in Week 8 provided one marginal opportunity for a mark and recapture estimate for pink salmon as follows:

Week	Total Catch	Tags Out	Recaps.	Pop. Est.	95% Conf. Limits
8	32	74	3	618	281-4125

The overall catch of chum salmon was generally too small to allow mark and recapture estimates. Combining the seine and trap net catch for Week 3 provides a marginal opportunity for an estimate of chum salmon as follows:

Week	Total Catch	Tags Out	Recaps.	Pop. Est.	95% Conf. Limits
3	14	15	5	40	19-92

Estimates of Total Escapement

Pink Salmon

There is no doubt that the population was small compared to most other years. The total number of untagged pink salmon caught in 1998 was 191 which represents a minimum escapement. Of the total captures, about 12 percent were tagged fish suggesting that significant numbers of fish were present but not captured. The single population estimate for Week 8 indicates that about 600 pink salmon may have been present at that time.

Another approach to escapement estimation is to compare the overall catch-per-hour for 1998 with the catch-per-hour for other years and relate to the escapement estimates for those years. Catch-per-hour was 40 times greater in 1997 than in 1998. Dividing the 1997 estimate of 32,500 fish by 40 yields an estimated 1998 escapement of 812 fish. Similarly, comparing catch rate and escapement with 1991 numbers yields a 1998 estimate of 946 fish. Based on the above information, it is reasonable to speculate that the total escapement in 1998 was likely between 400 and 1500.

Chum Salmon

The net catch of chum salmon in 1998 was 33 fish of which 30 percent were recaptures of fish caught previously. The population estimate for Week 3 indicated that about 40 fish may have been present in that week. The number of chum salmon utilizing the Bradley River was very small in 1998 with total escapement likely less than 100 fish.

Coho Salmon

The study ended early in the coho run, therefore escapement cannot be estimated. The total net catch was 30 cohos, none of which were recaptures.

Sockeye Salmon

A total of 107 sockeye salmon were caught during the study, of which 13 percent were recaptures. A conservative estimate of the number of sockeyes present in the Bradley River, based on observations during the 1997 season, is 300-500 fish.

Chinook Salmon

Combining untagged captures with untagged carcasses results in a total of 122 individual chinook salmon that were handled during the study period. Visual observations of the study area on July 21-22 resulted in a count of 117 fish that were actively spawning at that time. These numbers represent the minimum number of chinooks present in the study area in 1998. The

small number of total recaptures (3 percent) and the lack of recaptures from prior weeks prevented mark/recapture estimates, but also suggested that the actual number of fish present was substantially larger than the number caught in the nets. A conservative estimate of the escapement of chinooks to the Bradley River is 300-600 fish.

Tag Returns From Outside the Study Area

No tag returns from outside the study area were reported to the Alaska Department of Fish and Game or the Alaska Energy Authority in 1998

Physical Data

Air and water temperature, turbidity, and relative water level data are presented in Appendix C. Temperature data were usually collected in early morning and, thus, are approximately representative of daily minimums. Water temperature showed relatively little variation, ranging from 3 to 9 degrees C. Both water and air temperatures tended to be quite cool compared to prior years, especially during the last half of the study period. Turbidity was low during the first week of the study, relatively high during Weeks 2-6, very low during Week 7, and moderately high in Week 8. Turbidity in the regulated Bradley River reflects the proportion of flow contributed by turbid water from the Bradley Lake reservoir released via the fish water bypass. Heavy precipitation during the August 30 - September 1 period increased the availability of water in the watershed, allowing release of water from the reservoir to be shut off in early September and, thus, greatly reducing turbidity during Week 7. River water level was very stable during most of the study period except during the Week 7 period when heavy rain, as discussed above, caused the level to rise temporarily by 0.8 ft.

Miscellaneous Observations

Bears

Black bear tracks and scat were present in the study area throughout the study period. On two occasions during Week 3 bears pulled trap nets out of alignment, presumably trying to reach fish. A small black bear was sighted on August 24. The tracks suggested that a female black bear with a cub utilized the study area as part of their territory throughout the study period. The bears were shy and did not cause problems with the field camp.

Eagles

The eagle nest downstream from Net 4 which was active in 1996 and 1997 appeared to be active again in 1998 early in the study period. However, no young were ever observed. Reproduction may have been unsuccessful in 1998.

Other Wildlife

A river otter was observed in the upper study area on September 8. A mink became tangled in one of the nets on August 11. The mink was freed without harm. Three other mink, presumably members of the same family, were observed as the team worked to free the animal. As in past

years, harbor seals were observed as far upstream in the Bradley River as the fish camp during extreme high tides (August 12 and September 10).

DISCUSSION

Validity of Abundance Indices and Estimates

The small number of pink salmon present in the Bradley River in 1998 prevented the use of weekly mark/recapture population estimates which have provided the basis for estimates of total escapement in most past years. Population numbers presented above for pink salmon and the other salmon species are speculative. However, trap net catch-per-hour provides a reasonably reliable index of relative abundance that can be usefully compared from year to year.

Comparison With Prior Years

Pink Salmon

Figure 12 compares the overall catch-per-hour and estimated total escapements for the years 1986 through 1998. Pink salmon returns to the Bradley River in 1998 were among the lowest since the beginning of the study. Even year returns have been poor in the Bradley River since 1986 and the 1998 escapement estimate is consistent with the even-year trend.

Wild pink salmon returns to Kachemak Bay streams were generally poor to fair as is typical of even numbered years; Humpy Creek, the largest pink salmon producer in Kachemak Bay, had an estimated escapement of 17,500 fish which is considered relatively good for an even-year run (L. Bucher, ADF&G, personal communication). Returns to the Tutka Bay hatchery were good suggesting good saltwater survival of hatchery fish. Numbers of pink salmon observed in the Bradley River were somewhat lower than might be expected in light of area-wide trends.

Chum Salmon

The catch rate for chum salmon in the Bradley River in 1998 was low compared to most past years (Figure 13). Estimated chum salmon escapements have varied from 50 fish to 1600 fish since 1986. Chum salmon returns to Lower Cook Inlet streams have been generally low for the last several years and were low again in 1998 (L. Bucher, ADF&G, personal communication). The relatively low number of chums in the Bradley River in 1997 was consistent with area trends.

Coho Salmon

Study timing in 1998, as well as in previous years, has prevented estimates of coho salmon escapement and meaningful comparisons are difficult. The 1998 trap net catch rate was the second lowest since the beginning of the study program (Figure 14) and may reflect either a low population or a late run. Coho salmon returns to south-central Alaska streams were generally good in 1998 (L. Bucher, ADF&G, personal communication), consequently the below average return to the Bradley River appears inconsistent with area trends

Sockeye Salmon

The sockeye salmon catch in 1998 was about average relative to catches in other post-regulation years (Figure 15).

Chinook Salmon

The catch-per-hour for chinook salmon in 1998 was the second highest since the beginning of the study (Figure 16). Since the study period begins during the latter part of the chinook spawning period, it is likely that the overall catch rate underestimates the relative abundance of chinooks. Success of chinook salmon under the regulated flow regime appears to be very good based on the 1995 through 1998 returns. All spawners returning to the Bradley River in 1998 were likely spawned and reared under regulated flows.

SUMMARY OF FINDINGS FOR THE YEARS 1996-1998

The annual report prepared in 1995 (Alaska Energy Authority, 1995) contained a summary of the results of the 10 years of study from 1986 through 1995 under the FERC-mandated study program. That summary contained the following conclusions:

1. Odd year pink salmon were doing well under the regulated flow regime with excellent survival as indicated by the large runs in 1993 and 1995. Early evidence suggested that the runs may be more stable with flow regulation.
2. Even year pink salmon continued to be poor under regulated flow, although there was some suggestion of increased stability and survival because of the somewhat larger escapement in 1994.
3. Consistently low chum salmon escapement since 1991 suggested that chums may have been adversely affected by the regulated flows, possibly because of decreased availability of upwelling ground water. However, chum salmon returns were poor area-wide during the 1990-1995 period and the Bradley River may have reflected trends from the broader area.
4. A gradual increase was seen in the number of sockeye salmon in the Bradley River since the beginning of the study in 1986. This increase may have been the result of straying from various enhanced fisheries in the area. The presence of sockeye salmon fry indicated that at least some natural reproduction was occurring in the river.
5. Numbers of chinook salmon appeared to be increasing with returns in 1993-1995 well above average. The successful 1995 run suggested that survival of chinooks spawned and reared under the regulated flow regime was good. There were qualitative indications that spawning and rearing habitats for chinooks may have expanded with the stable flow regime.
6. Wildlife use of the river corridor had dramatically increased under regulated flow because of the greater availability of salmon to a variety of bird and mammal species and the enhanced accessibility due to much lower summer flow.

Most of the above conclusions are reinforced by the additional data for the years 1996-1998. The very large pink salmon run in 1997 (Figure 12) continued the favorable outlook for odd-year pink salmon and continued to suggest that survival may be more consistent with regulated flow. However, the even-year returns in 1996 and 1998 were disappointing, suggesting that survival

was not especially good for the even-year stocks. Poor even-year runs that began prior to regulation have continued under the regulated regime and show no sign of recovery to date. Chum salmon numbers continued to be low, reflecting area trends. The catch of sockeyes and cohos was inconsistent and no trends were obvious.

The apparent success of chinook salmon under the regulated flow regime is the most dramatic project impact. Catch rate and probable escapement was the highest on record during the years 1995 through 1998 (Figure 16). Adults returning in these years were probably all spawned and reared since the advent of regulated flow, providing strong evidence of good survival. While the number of chinooks returning in any given year is relatively small, the density of use within the short segment of useable habitat is high. The lower Bradley River should be considered high quality chinook salmon habitat.

Wildlife use of the Bradley River corridor continued to be high in the years 1996-1998. The availability of pink salmon carcasses in odd years is particularly significant, providing a large food source for bears, eagles, gulls, and other animals.

ACKNOWLEDGEMENTS

We would like to thank the Homer Electric Association Bradley Lake Hydroelectric Project powerhouse staff for their cooperation and logistical support of the Northern Ecological Services field crew during the course of the study. Special thanks go to biological technicians, Wade Lawrence and John Stryker, for conducting the field work in a safe, efficient, and professional manner under conditions that were not always favorable.

REFERENCES

Alaska Power Authority, 1986a. Salmon monitoring plan for Federal Energy Regulatory Commission Project No. P-8221-000. Prepared by Stone and Webster Engineering Corp., Anchorage, Ak.

_____, 1986b. Bradley River salmon escapement monitoring report for 1986. Prepared by Dames & Moore under contract to Bechtel Civil & Minerals, Inc. for the Alaska Power Authority, Bradley Lake Hydroelectric Project. Anchorage, Ak.

_____, 1987. Bradley River salmon escapement monitoring report for 1987. Prepared by Dames & Moore under contract to Bechtel Civil & Minerals, Inc. for the Alaska Power Authority, Bradley Lake Hydroelectric Project. Anchorage, Ak.

_____, 1988. Bradley River salmon escapement monitoring report for 1988. Prepared by Dames & Moore under contract to Bechtel Civil & Minerals, Inc. for the Alaska Power Authority, Bradley Lake Hydroelectric Project. Anchorage, Ak.

Alaska Energy Authority, 1989. Bradley River salmon escapement monitoring study-1989. Prepared by Northern Ecological Services for the Alaska Energy Authority, Anchorage, Alaska

_____, 1990. Bradley River salmon escapement monitoring study-1990. Prepared by Northern Ecological Services for the Alaska Energy Authority, Anchorage, Alaska

_____, 1991. Bradley River salmon escapement monitoring study-1991. Prepared by Northern Ecological Services for the Alaska Energy Authority, Anchorage, Alaska

_____, 1992. Bradley River salmon escapement monitoring and tailrace attraction studies-1992. Prepared by Northern Ecological Services for the Alaska Energy Authority, Anchorage, Alaska

_____, 1993. Bradley River salmon escapement monitoring and tailrace attraction studies-1993. Prepared by Northern Ecological Services for the Alaska Energy Authority, Anchorage, Alaska

_____, 1994. Bradley River salmon escapement monitoring and salmon rearing studies-1994. Prepared by Northern Ecological Services for the Alaska Energy Authority, Anchorage, Alaska

_____, 1995. Final Report - Bradley River salmon study program. Prepared by Northern Ecological Services for the Alaska Energy Authority, Anchorage, Alaska

_____, 1996. Annual Report - Bradley River salmon study program. Prepared by Northern Ecological Services for the Alaska Energy Authority, Anchorage, Alaska

_____, 1997. Annual Report - Bradley River salmon study program. Prepared by Northern Ecological Services for the Alaska Energy Authority, Anchorage, Alaska

Bucher, Les (Alaska Dept. of Fish & Game), 1998. Personal communication with John Morsell, Northern Ecological Services.

Northern Technical Services, Inc., 1985. 1985 salmon escapement survey report. Prepared for the Alaska Power Authority, Anchorage, Ak.

Ricker, W.E., 1975. Computation and interpretation of biological statistics of fish populations. Bull. Fish. Res. Board Can. 191. 383 pp.

U.S. Fish and Wildlife Service, 1982. Appendix B: Bradley Lake Hydroelectric Project, Homer, Alaska. Final coordination report. USFWS Western Alaska Ecological Services, Anchorage, Alaska. 131 pp. In: U.S. Army Corps of Engineers, 1982. Bradley lake Hydroelectric Project, Alaska. Final Environmental Impact Statement. Alaska District, U.S. Army Corps of Engineers.

Woodward Clyde Consultants, 1983. Bradley River instream flow studies. Prepared for the Alaska Power Authority, Anchorage, Ak. 77 pp.

Woodward Clyde Consultants, 1984. Report on salmon fry sampling in the Bradley River. Prepared for the Alaska Power Authority, Anchorage, Ak. 6 pp.

Tables

TABLE 1. TOTAL CATCH FOR ALL SAMPLE METHODS COMBINED – 1998

WEEK NO.	DATES	PINK SALMON	CHUM SALMON	COHO SALMON	SOCKEYE SALMON	CHINOOK SALMON	DOLLY VARDEN
1	JUL 21-23	13	7			77	13
2	JUL 28-30	10	11	1	6	14	27
3	AUG 4-6	38	14		15	17	23
4	AUG 11-13	7	1	8	29	3	25
5	AUG 18-20	41	1	3	27	4	11
6	AUG 25-27	15		7	12	2	10
7	SEP 1-3	29		3	13		10
8	SEP 8-10	63		8	5	1	7
TOTAL		216	34	30	107	118	126

TABLE 2. TRAP NET CATCH STATISTICS FOR SALMON IN THE BRADLEY RIVER-1998.

	SAMPLING WEEK																	
	1		2		3		4		5		6		7		8		TOTAL	
SPECIES	CATCH	CPH	CATCH	CPH	CATCH	CPH	CATCH	CPH	CATCH	CPH	CATCH	CPH	CATCH	CPH	CATCH	CPH	CATCH	CPH
PINK	13	0.046	10	0.035	14	0.049	6	0.021	26	0.091	15	0.052	4	0.015	31	0.108	119	0.05
CHUM	7	0.025	11	0.038	12	0.042	1	0.003	1	0.004		0.000		0.000		0.000	32	0.01
COHO		0.000	1	0.003		0.000	8	0.028	2	0.007	6	0.021	3	0.012	5	0.017	25	0.01
SOCKEYE		0.000	6	0.021	15	0.052	27	0.094	26	0.091	12	0.042	13	0.050	5	0.017	104	0.05
CHINOOK	77	0.271	14	0.049	16	0.055	3	0.010	3	0.011	2	0.007		0.000	1	0.003	116	0.05

TABLE 3. SEINE CATCH SUMMARY FOR PINK SALMON - 1998.

DATE	UNTAGGED	TAGGED	TOTAL
4-Aug	19	5	24
11-Aug	1	0	1
18-Aug	13	2	15
3-Sep	24	1	25
8-Sep	29	3	32
TOTALS	86	11	97

TABLE 4. CARCASS COUNT SUMMARY - 1998

SPECIES	DATE	UNTAGGED	TAGGED	TOTAL
PINK SALMON	4-Aug	1	0	1
	8-Sep	6	0	6
		7	0	7
CHUM SALMON	4-Aug	1	0	1
	11-Aug	1	0	1
	20-Aug	1	0	1
		3	0	3
CHINOOK SALMON	4-Aug	2	0	2
	5-Aug	1	0	1
	11-Aug	1	1	2
	18-Aug	2	0	2
	19-Aug	1	0	1
		7	1	8
SOCKEYE SALMON	2-Sep	1	0	1
	8-Sep	2	0	2
		3	0	3

TABLE 5. COMPARISON OF THE WEEK OF MARKING WITH THE WEEK OF RECAPTURE FOR ALL PINK SALMON TRAP NET RECAPTURES - 1998.

RECAPTURE WEEK	MARKING WEEK 1	2	3	4	5	6	7	8	TOTAL
1	1								1
2	1	0							1
3	0	0	1						1
4	0	0	0	0					0
5	0	0	1	1	2				4
6	0	0	0	0	1	0			1
7	0	0	0	0	0	1	0		1
8	0	0	0	0	1	0	0	7	8
TOTAL RECAPS.	2	0	2	1	4	1	0	7	17
TOTAL TAGS OUT	10	9	28	6	33	14	27	45	172
% RECAPTURED	20	0	7	17	15	7	7	16	12

Figures

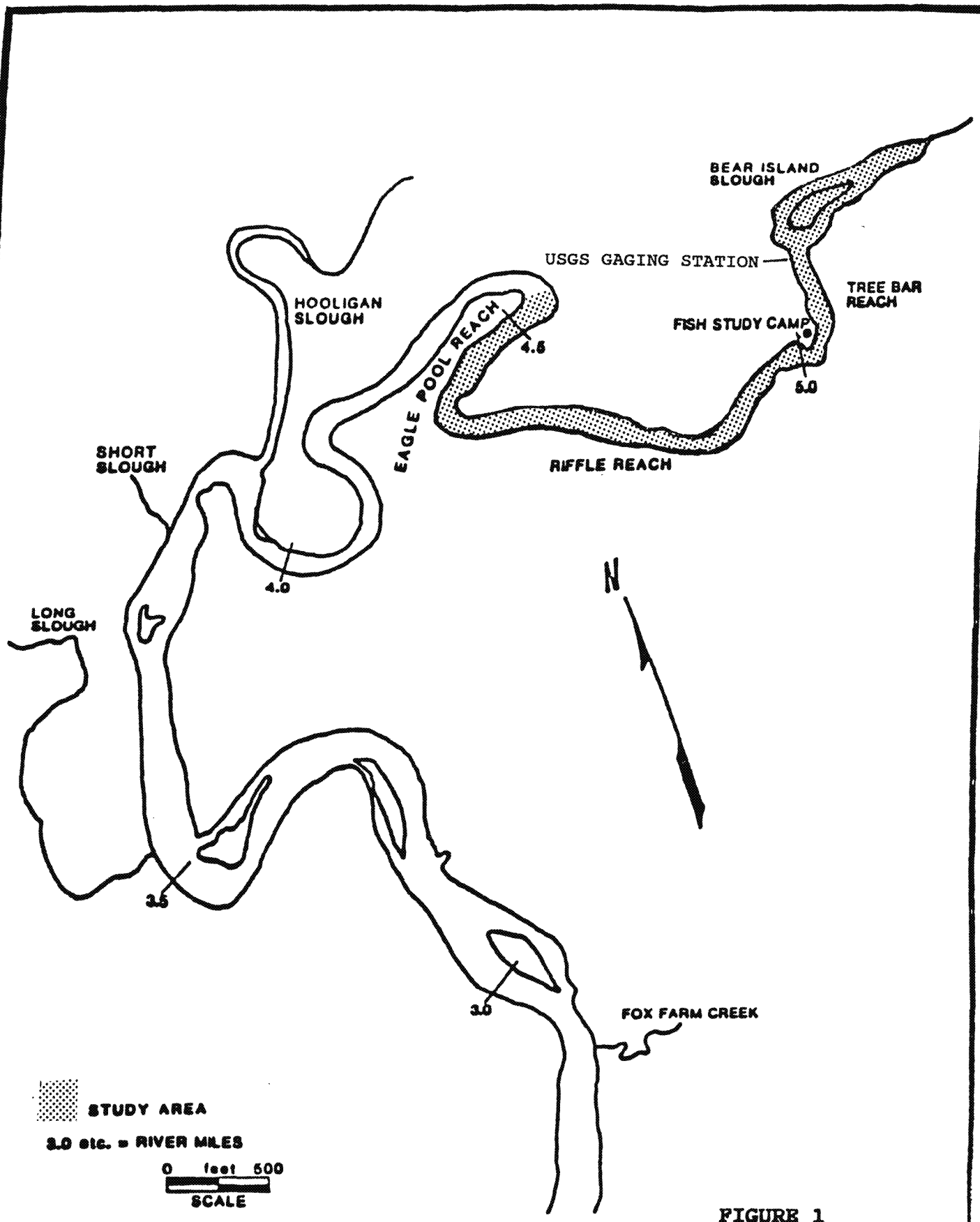


FIGURE 1

LOWER BRADLEY RIVER WITH SALMON ESCAPEMENT STUDY AREA

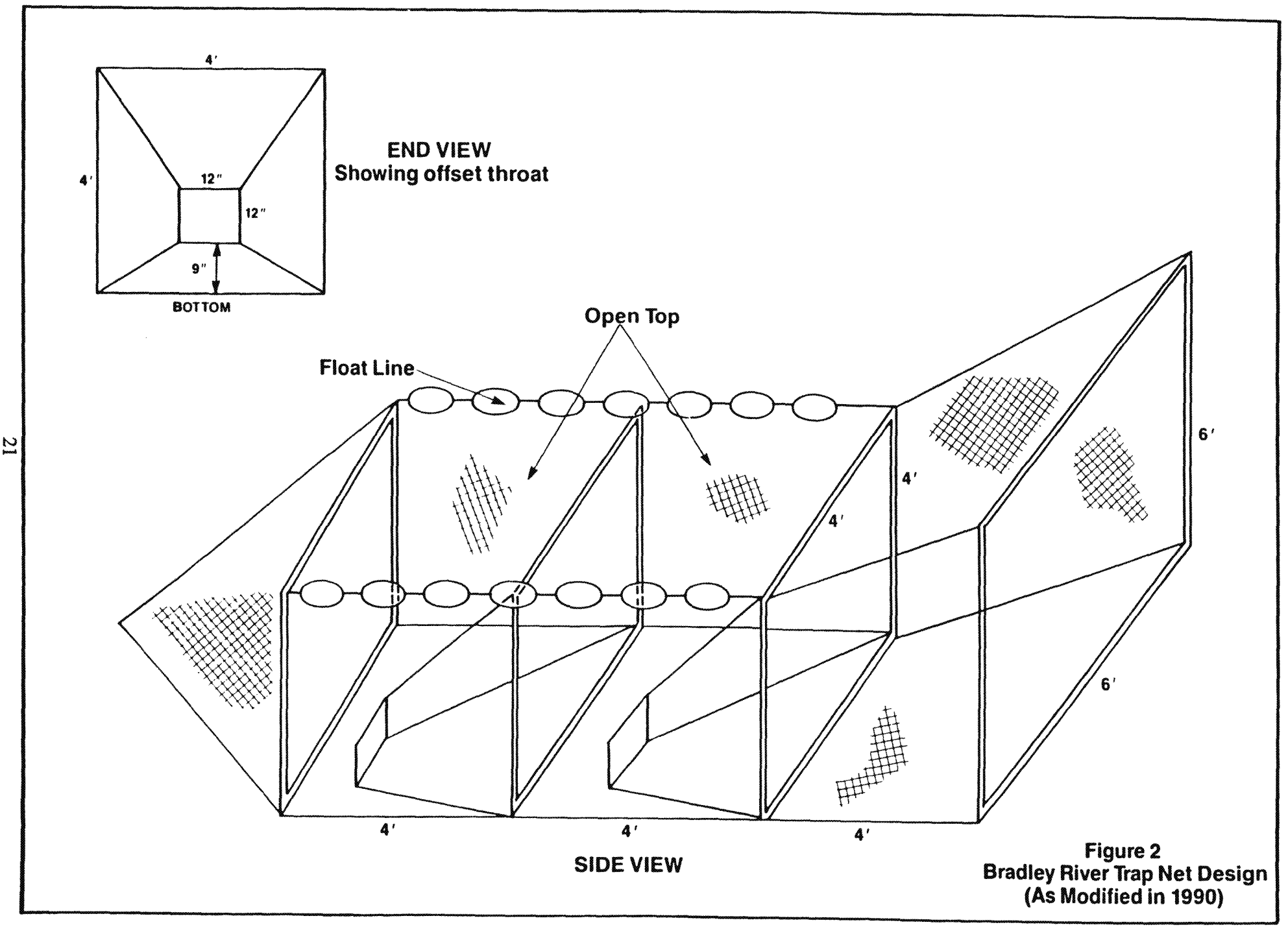


Figure 2
Bradley River Trap Net Design
(As Modified in 1990)

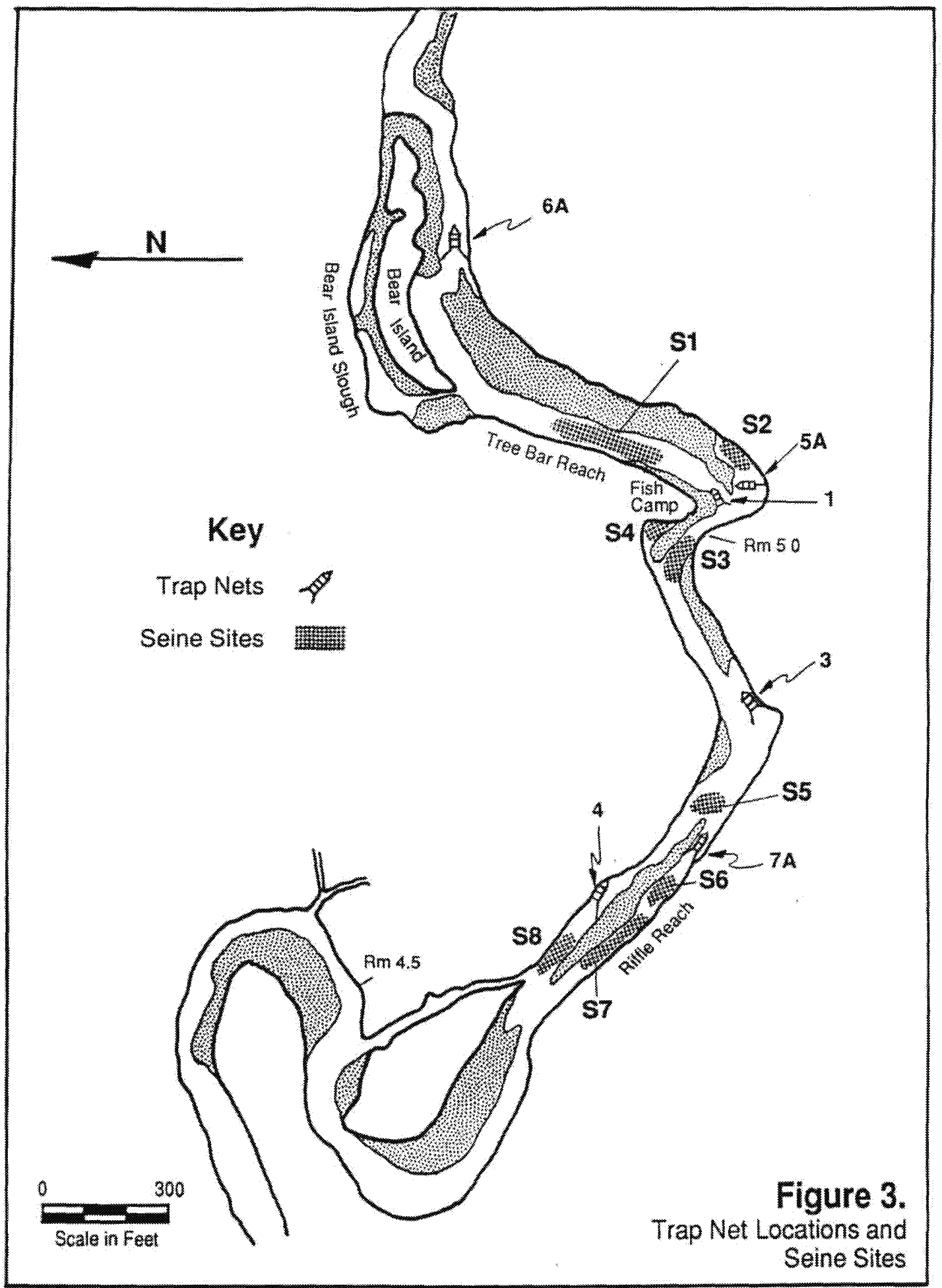


Figure 3.
Trap Net Locations and Seine Sites

Figure 4. Catch-per-unit-effort for pink salmon by study week.

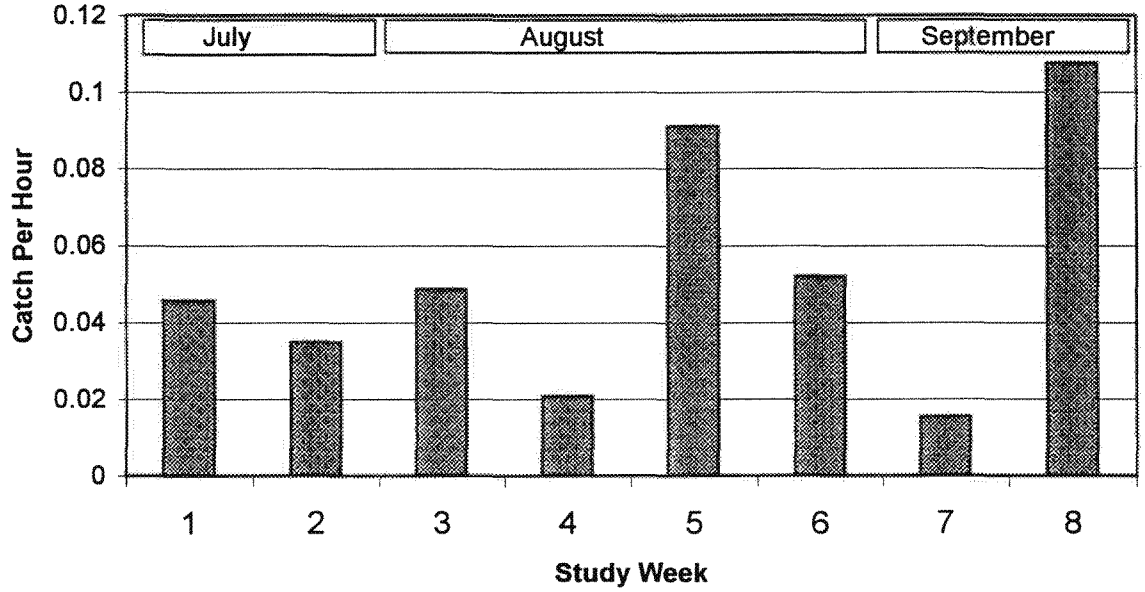


Figure 5. Catch-per-unit-effort for chum salmon by study week.

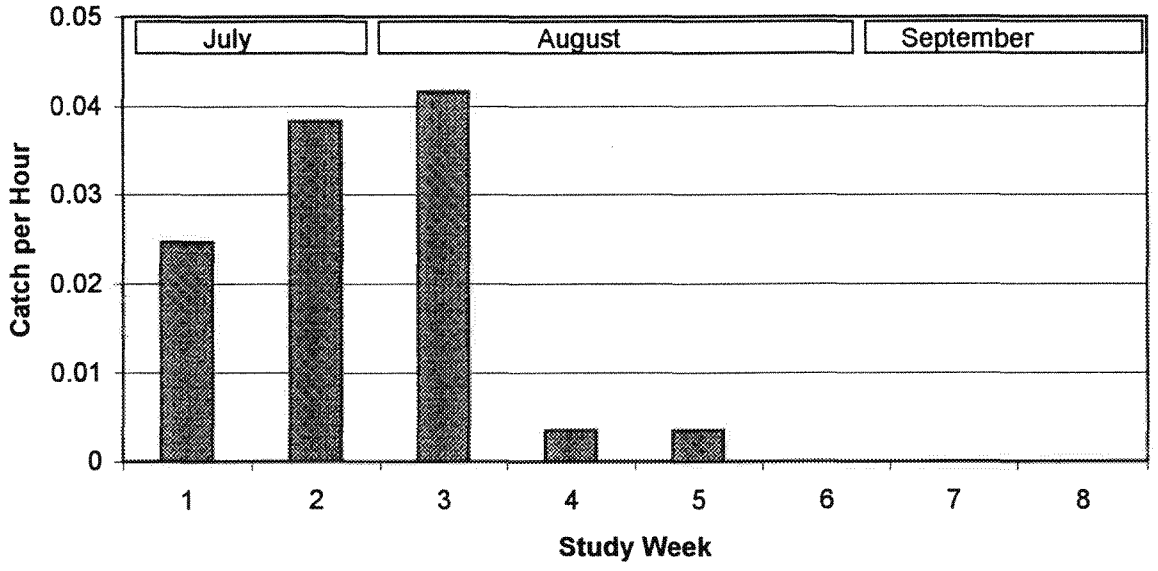


Figure 6. Catch-per-unit-effort for coho salmon by study week.

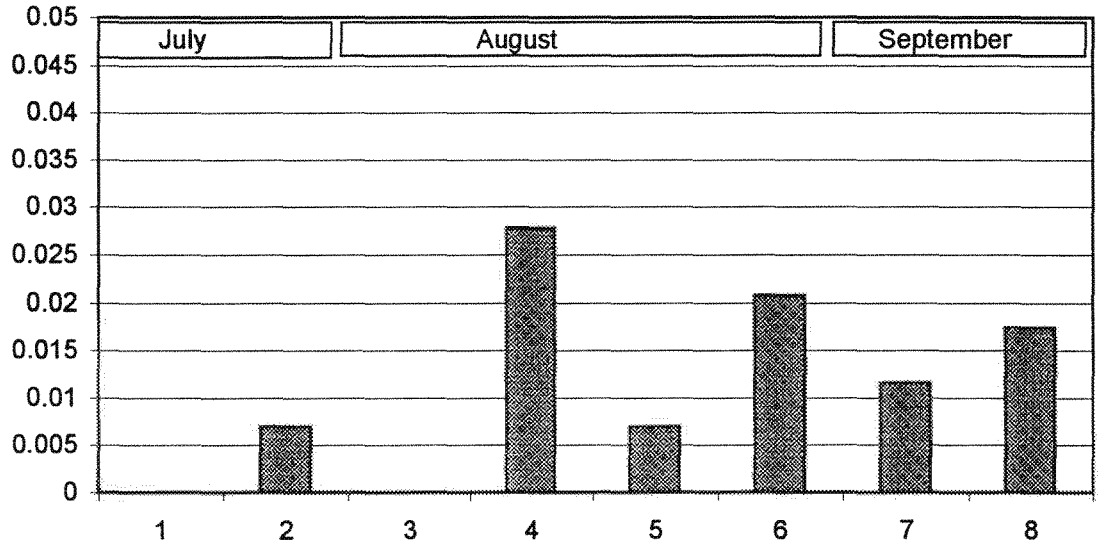


Figure 7. Catch-per-unit-effort for sockeye salmon by study week.

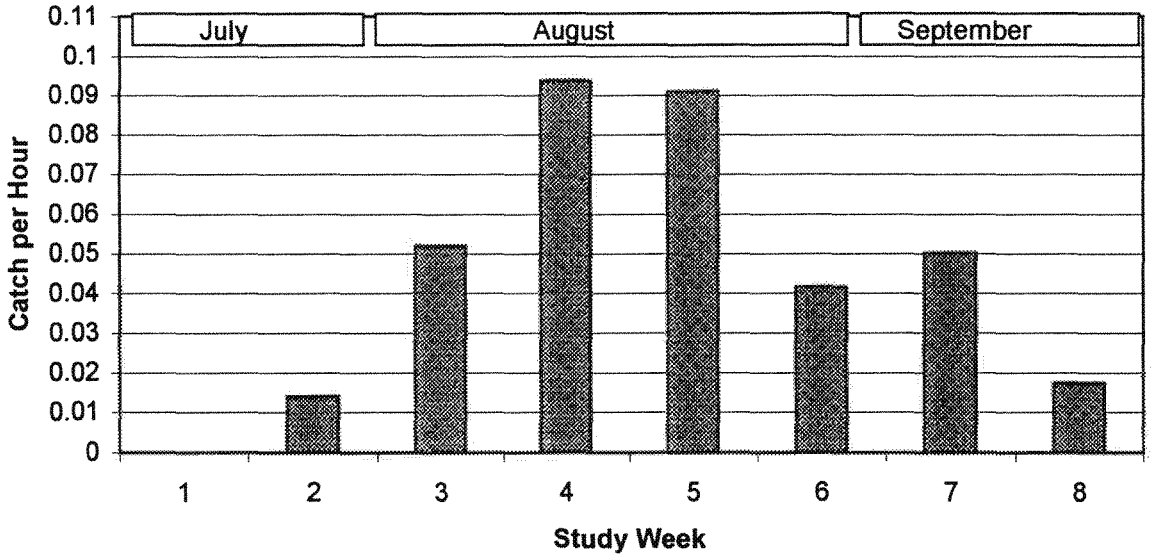


Figure 8. Catch-per-unit-effort for chinook salmon by study week.

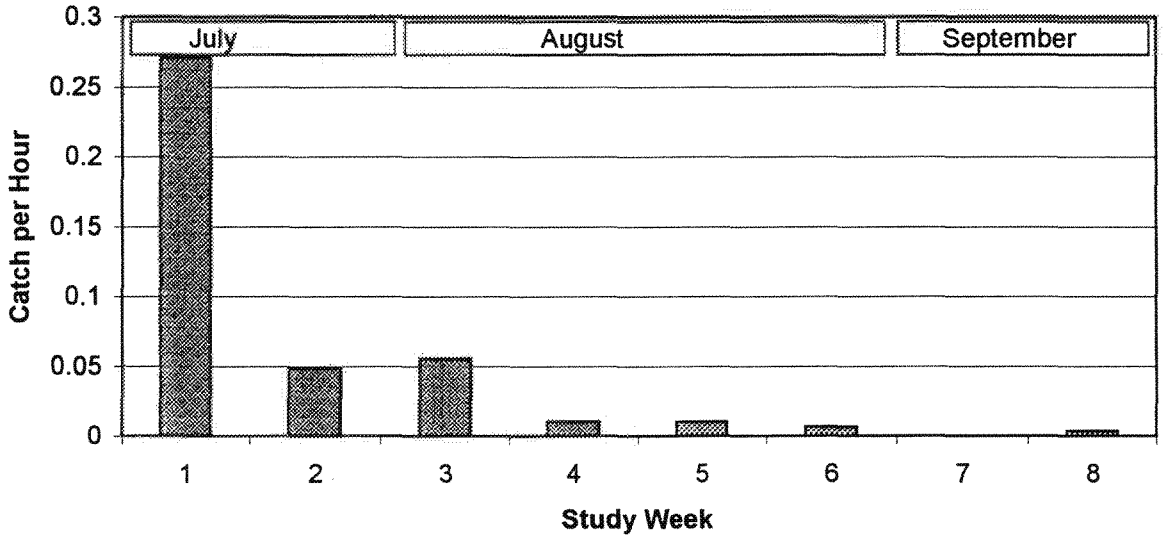


Figure 9. Catch-per-unit-effort for Dolly Varden by study week.

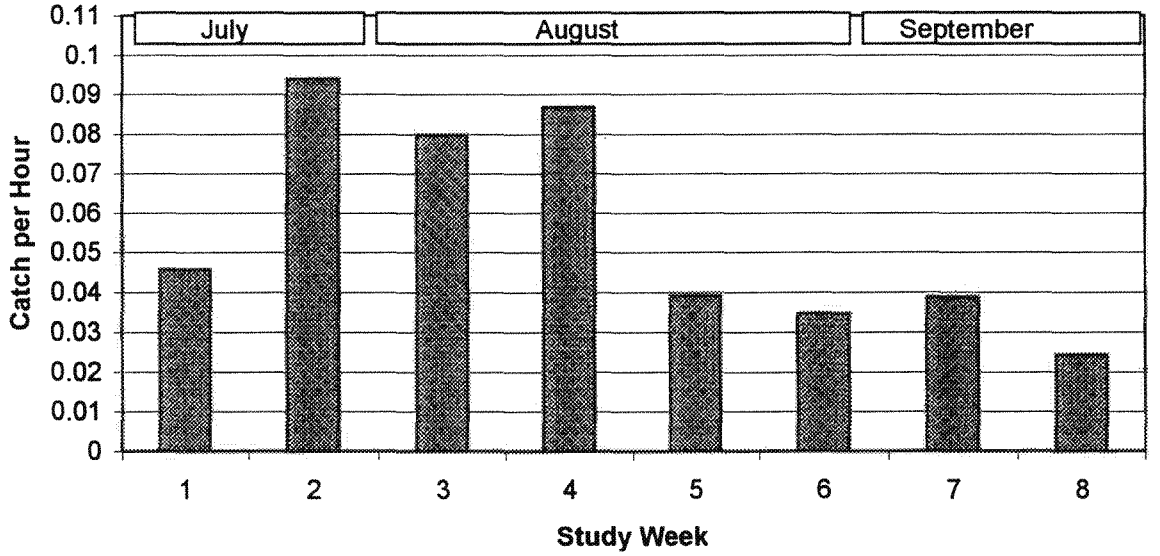
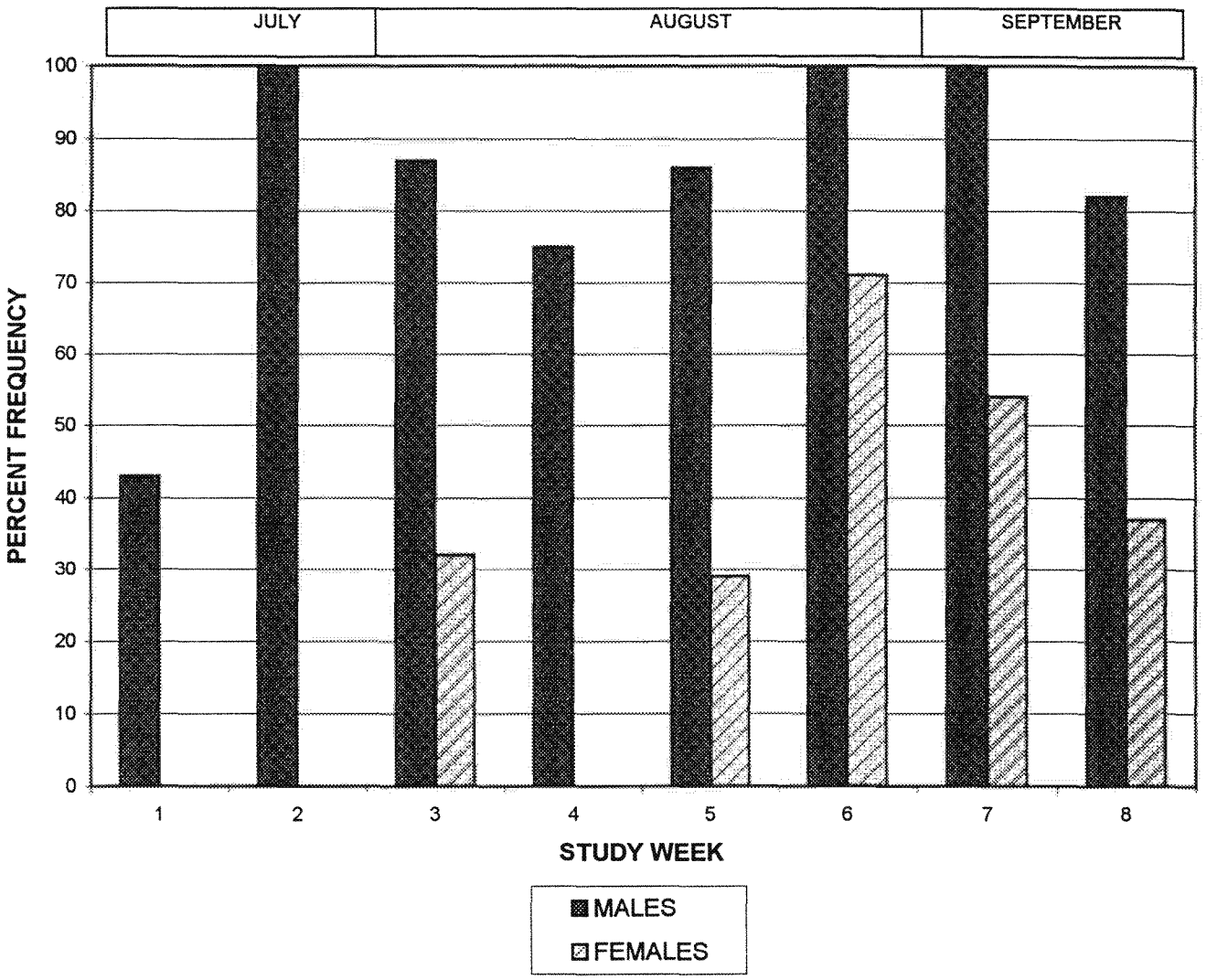


FIGURE 10. PERCENT FREQUENCY OF OCCURRENCE OF RIPE PINK SALMON BY STUDY WEEK.



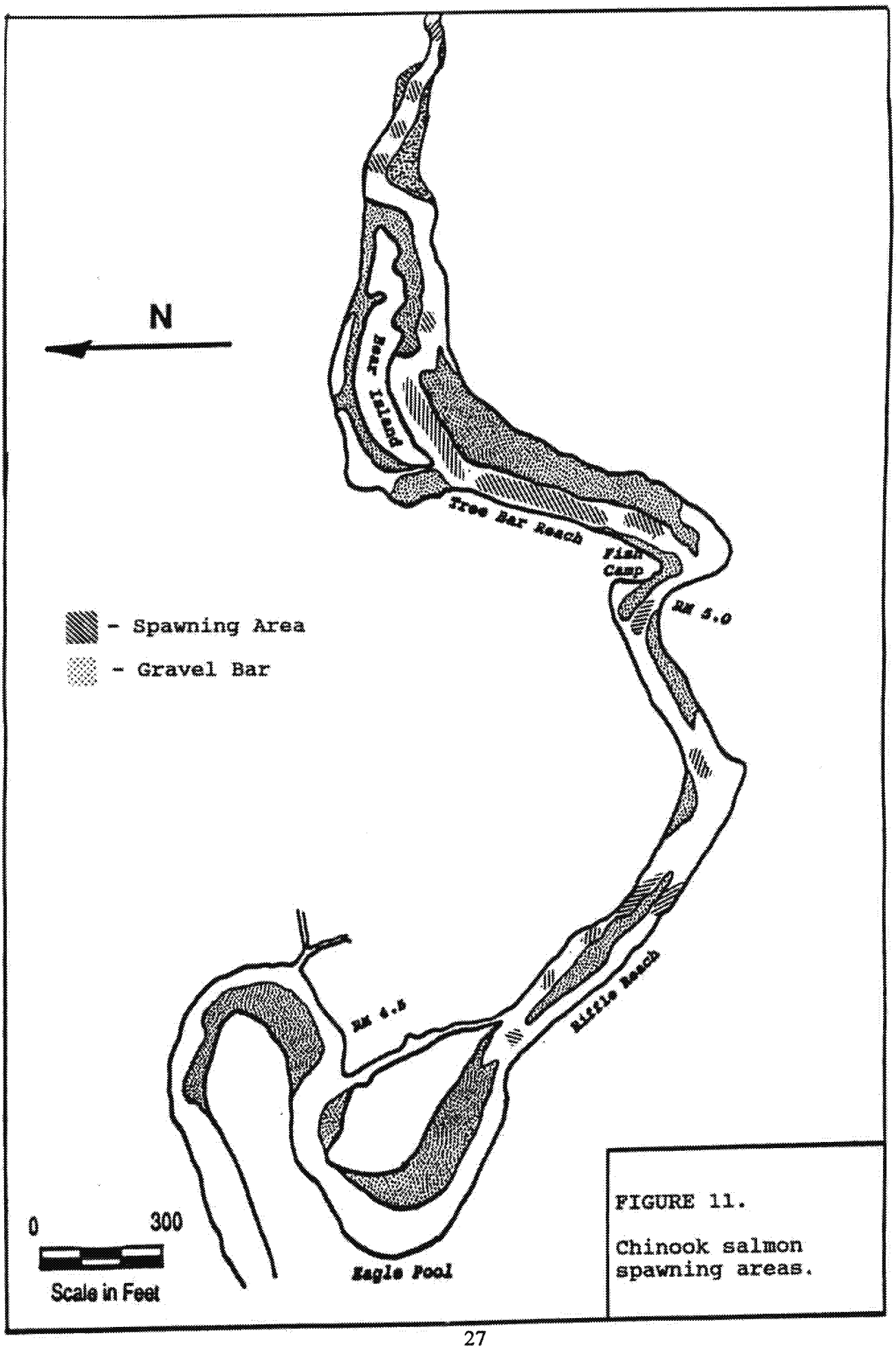


FIGURE 11.

Chinook salmon spawning areas.

FIGURE 12. ESTIMATED ESCAPEMENT AND TRAP NET CATCH-PER-HOUR FOR PINK SALMON-1998.

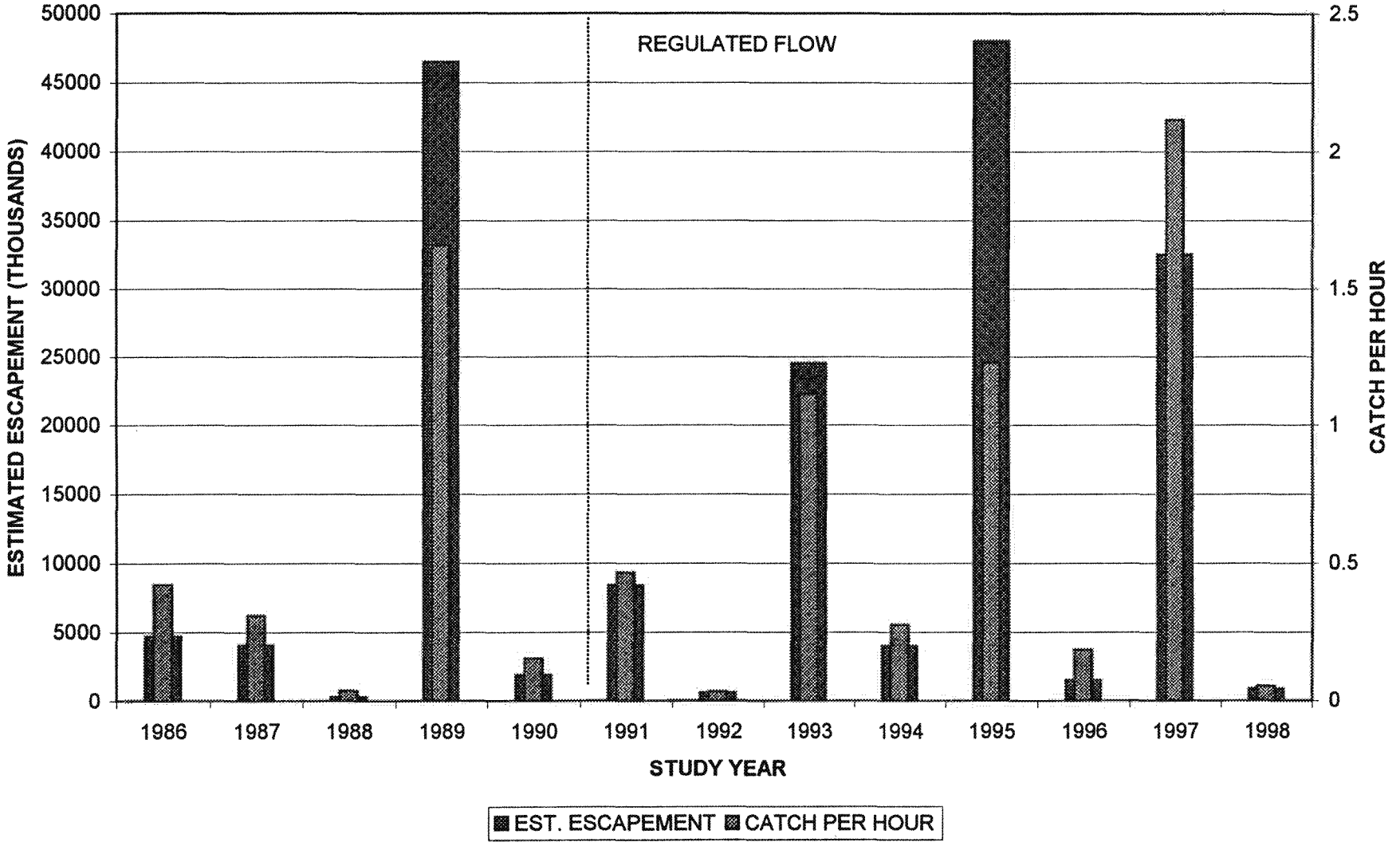


FIGURE 13. TRAP NET CATCH-PER-HOUR FOR CHUM SALMON - 1986 THROUGH 1998.

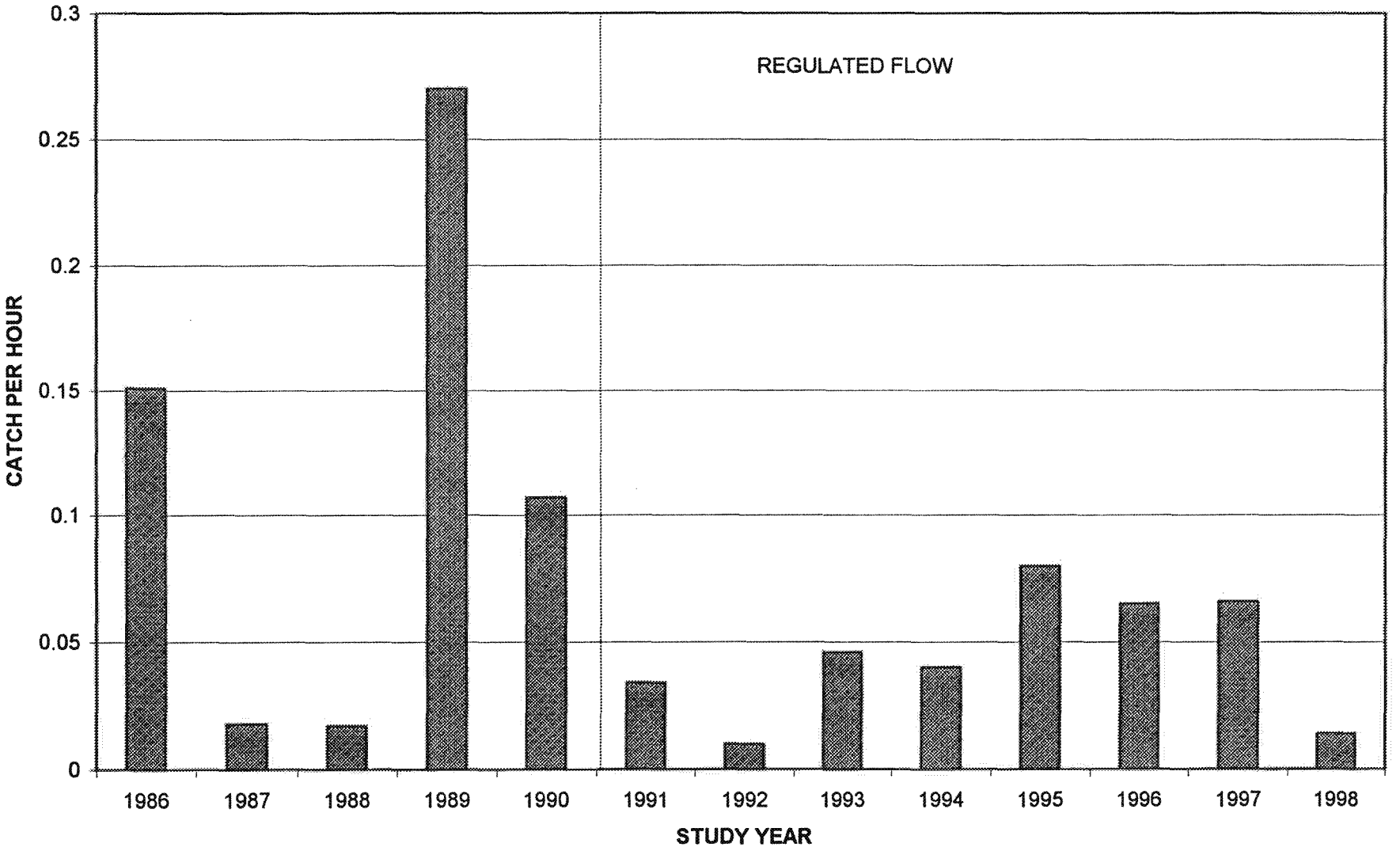


FIGURE 14. TRAP NET CATCH-PER-HOUR FOR COHO SALMON - 1986 THROUGH 1998.

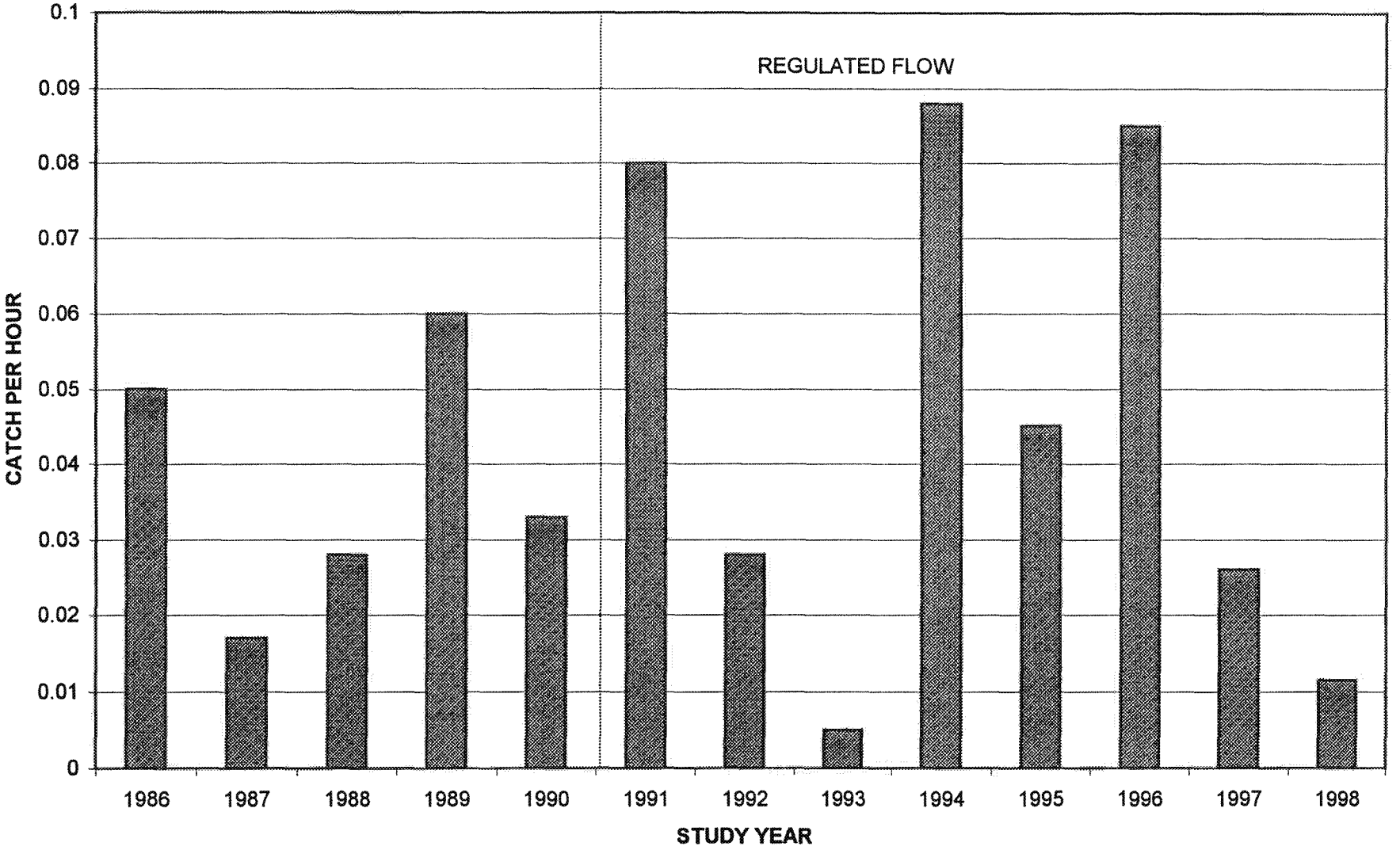


FIGURE 15. TRAP NET CATCH-PER-HOUR FOR SOCKEYE SALMON - 1986 THROUGH 1998.

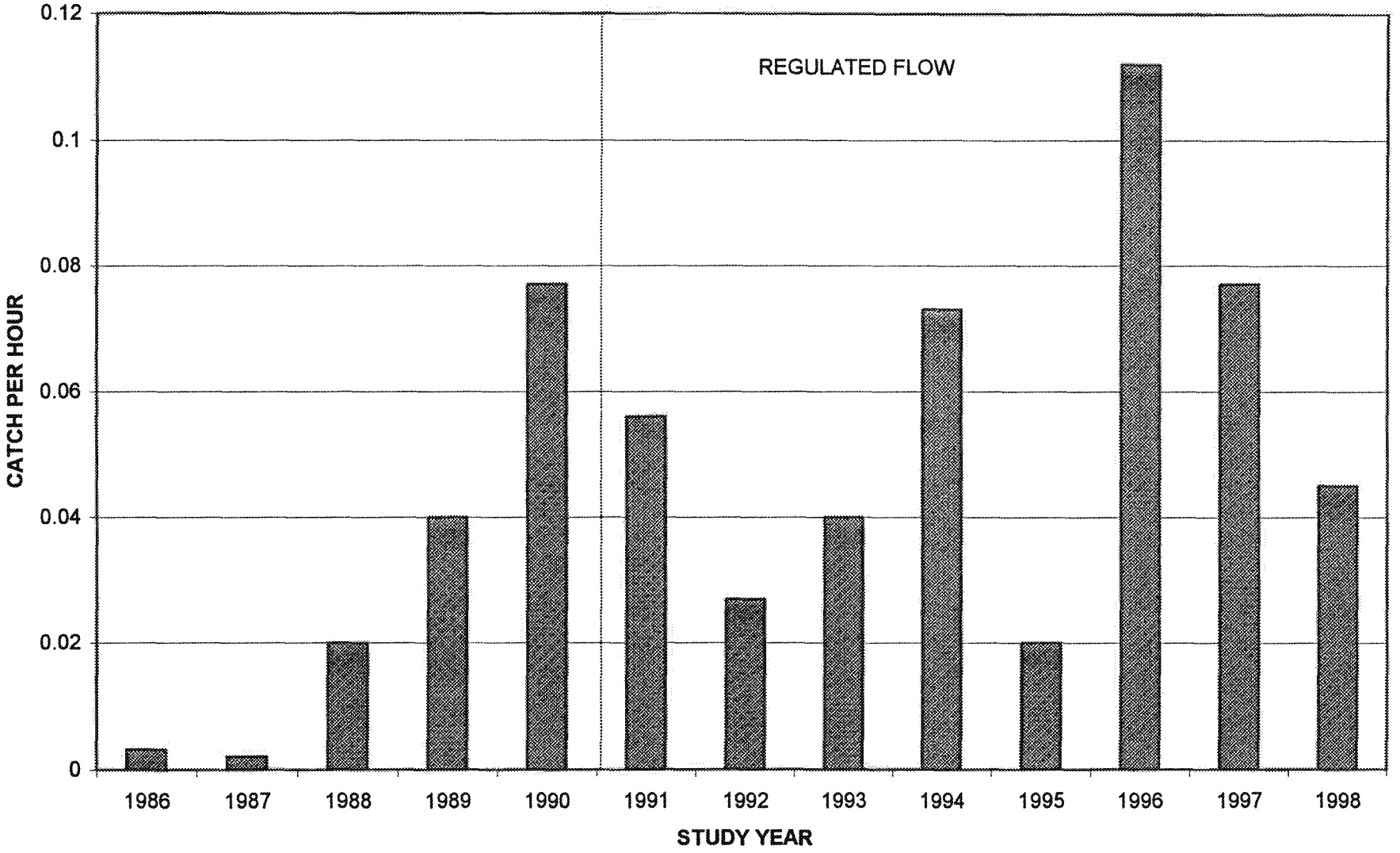
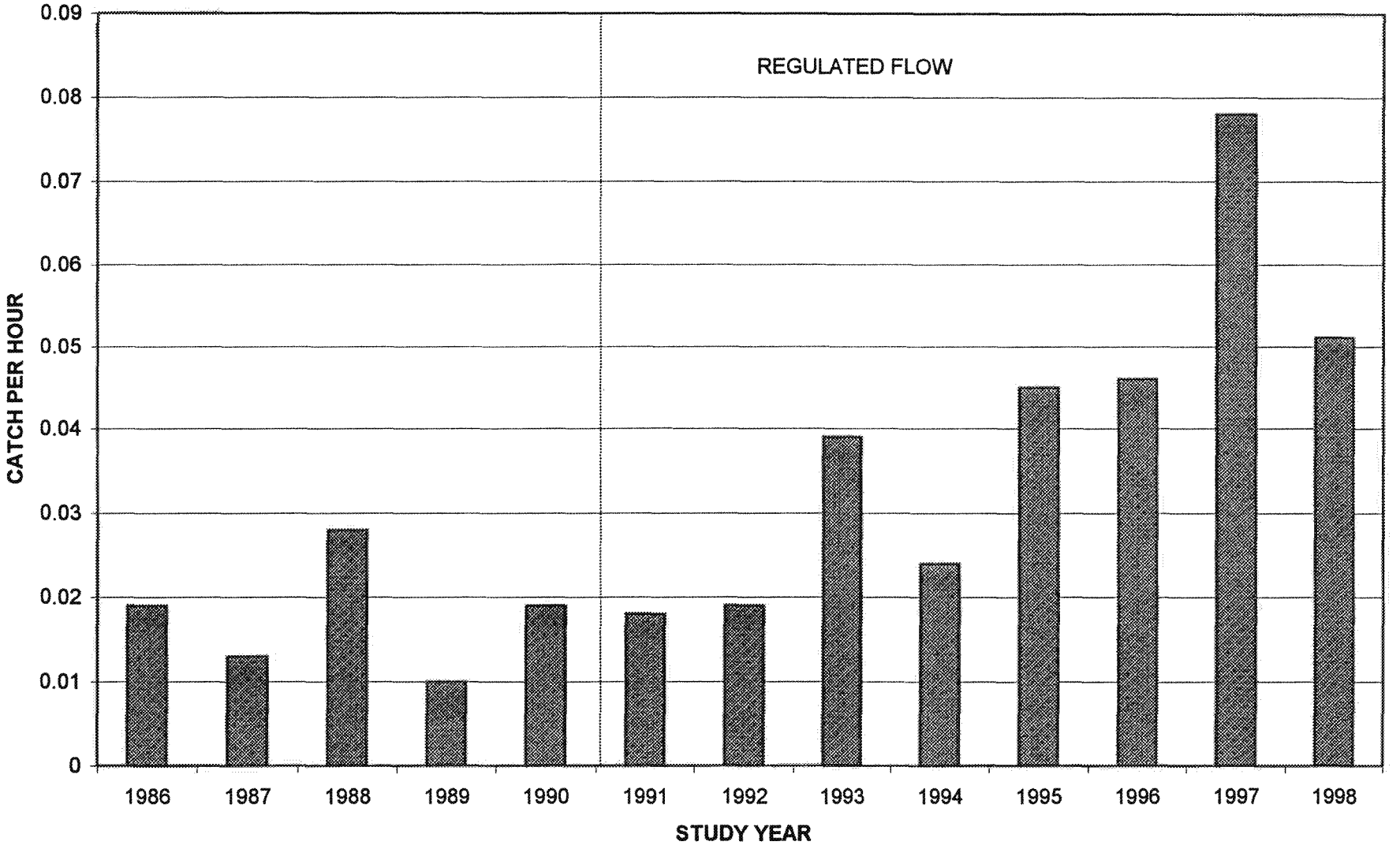


FIGURE 16. TRAP NET CATCH-PER-HOUR FOR CHINOOK SALMON - 1986 THROUGH 1998.



Appendices

APPENDIX A-1. PINK SALMON CATCH RECORDS Page 1

WEEK	DAY	METHOD	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
1	7/21	1	4	F	1	522	Y	9020	
1	7/22	1	1	F	2	462	Y	9029	
1	7/22	1	7	M	2	458	Y	9046	
1	7/22	1	4	M	6	399	Y		
1	7/22	1	4	M	3/6	420	Y		
1	7/22	1	5	M	3	422	Y	9068	
1	7/22	1	7	?	1	525	Y	9069	
1	7/22	1	7	M	2	502	Y	9070	
1	7/22	1	7	F	2	454	Y	9071	
1	7/22	1	1	M	3	423	Y		9068
1	7/23	1	7	F	2	517	Y	9096	
1	7/23	1	4	M	2	514	Y	9099	
1	7/23	1	4	F	1	474	Y	9100	
2	7/28	1	4	M	3	411	Y	9101	
2	7/28	1	1	M	3	440	Y	9105	
2	7/28	1	7	M	3	406	Y	9107	
2	7/28	1	4	M	3	473	Y	9109	
2	7/28	1	4	M	3	420	Y		9068
2	7/28	1	4	M	3	475	Y	9110	
2	7/29	1	3	F	2	382	Y	9113	
2	7/29	1	4	M	3	472	Y	9117	
2	7/29	1	4	M	3	510	Y	9118	
2	7/30	1	7	M	3	578	Y	9122	
3	8/4	2	S1	M	3	550	Y	9124	
3	8/4	2	S1	M	3	442	Y	9125	
3	8/4	2	S1	F	3	424	Y	9126	
3	8/4	2	S1	F	3	483	Y	9127	
3	8/4	2	S1	M	3	434	Y	9128	
3	8/4	2	S1	M	3	439	Y	9129	
3	8/4	2	S1	M	3	458	Y	9130	
3	8/4	2	S1	F	3	451	Y	9131	
3	8/4	2	S3	M	3	597	Y	9132	
3	8/4	2	S3	M	3	500	Y	9133	
3	8/4	2	S3	M	3	440	Y		9125
3	8/4	2	S3	F	2	495	Y	9135	
3	8/4	2	S3	F	3	493	Y	9136	
3	8/4	2	S3	F	3	408	Y	9137	
3	8/4	2	S3	F	4	410	Y	9138	
3	8/4	2	S3	M	3	464	Y	9139	
3	8/4	2	S3	F	2	484	Y	9140	
3	8/4	2	S3	F	2	502	Y	9141	
3	8/4	2	S3	M	3	464	Y		9139
3	8/4	2	S3	F	2	561	Y	9142	
3	8/4	2	S3	F	4	410	Y		9138
3	8/4	2	S3	F	3	500	Y	9143	
3	8/4	2	S3	F	2	495	Y		9135
3	8/4	2	S3	F	2	502	Y		9141
3	8/4	1	4	M	3	462	Y	9145	
3	8/5	1	1	M	6				
3	8/5	1	1	M	6				
3	8/5	1	7	M	2	487	Y	9148	
3	8/5	1	7	F	2	521	Y	9149	
3	8/5	1	7	F	2	481	Y	9150	

WEEK	DAY	METHOD	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
3	8/5	1	4	M	3/6	500	Y		9133
3	8/5	1	4	M	3	455	Y	9154	
3	8/5	1	4	F	2	456	Y	9156	
3	8/5	1	4	M	6				
3	8/6	1	7	F	2	535	Y	9163	
3	8/6	1	4	M	3	584	Y	9165	
3	8/6	1	4	M		LOST			
3	8/6	1	4	F	2	490	Y	9166	
4	8/11	2	S1	M	3	569	Y	9168	
4	8/12	1	7	M	2	547	Y	9171	
4	8/13	1	7	M	3	543	Y	9173	
4	8/13	1	7	F	2	468	Y	9174	
4	8/13	1	7	F	2	520	Y	9175	
4	8/13	1	4		6				
4	8/13	1	4	M	3	540	Y	9176	
5	8/18	2	S1	F	3	515	Y		9175
5	8/18	2	S1	F	3	420	Y	9177	
5	8/18	2	S1	F	2	536	Y	9178	
5	8/18	2	S1	M	3	501	Y	9179	
5	8/18	2	S1	M	3	534	Y	9180	
5	8/18	2	S1	F	3	448	Y	9181	
5	8/18	2	S1	F	4	487	Y		9135
5	8/18	2	S1	M	3	463	Y	9182	
5	8/18	2	S3	M	3	514	Y	9183	
5	8/18	2	S3	M	3	566	Y	9184	
5	8/18	2	S3	F	2	545	Y	9185	
5	8/18	2	S3	F	2	476	Y	9186	
5	8/18	2	S3	M	3	568	Y	9187	
5	8/18	2	S3	M	3	590	Y	9190	
5	8/18	2	S3	F	3	503	Y	9192	
5	8/18	1	5	M	3	490	Y	9194	
5	8/18	1	7	M	3	519	Y	9195	
5	8/18	1	7	F	6				
5	8/19	1	5	M	3	483	Y	9197	
5	8/19	1	5	F	2	460	Y	9198	
5	8/19	1	5	M	2	553	Y	9200	
5	8/19	1	5	M	3	542	Y	9201	
5	8/19	1	5	M	2	500	Y	9202	
5	8/19	1	5	F	2	575	Y	9203	
5	8/19	1	5	F	2	530	Y	9204	
5	8/19	1	5	?	1	370	Y	9205	
5	8/19	1	4	F	6				
5	8/19	1	4	F	6				
5	8/19	1	3	M	3	371	Y		9205
5	8/19	1	6	M	3	450	Y	9206	
5	8/20	1	6	M	3	498	Y	9207	
5	8/20	1	6	M	3	560	Y	9208	
5	8/20	1	6	M	3	565	Y	9209	
5	8/20	1	6	M	3	548	Y	9210	
5	8/20	1	1	F	2	542	Y	9211	
5	8/20	1	1	F	2	531	Y		9204
5	8/20	1	3	M	3	590	Y	9212	
5	8/20	1	1	M	6				

APPENDIX A-1. PINK SALMON CATCH RECORDS Page 3

WEEK	DAY	METHOD	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
5	8/20	1	1	F	2	483	Y	9213	
5	8/20	1	5	M	2	543	Y	9214	
5	8/20	1	5	M	3	520	Y	9215	
6	8/25	1	1	M	3	520	Y	9216	
6	8/25	1	1	M	3	575	Y		9190
6	8/25	1	1	M	3	552	Y	9217	
6	8/25	1	1	M	3	543	Y	9218	
6	8/25	1	1	M	3	488	Y	9219	
6	8/25	1	1	F	3	452	Y	9220	
6	8/25	1	1	F	3	518	Y	9221	
6	8/25	1	1	F	3	535	Y	9222	
6	8/25	1	5	M	3	517	Y	9223	
6	8/26	1	3	F	3	502	Y	9225	
6	8/26	1	4	M	3	464	Y	9227	
6	8/27	1	6	M	3	523	Y	9228	
6	8/27	1	7	F	3	515	Y	9229	
6	8/27	1	7	F	2	535	Y	9230	
6	8/27	1	7	F	2	493	Y	9231	
7	9/2	1	1	F	2	500	Y	9233	
7	9/3	1	1	M	3	519	Y	9234	
7	9/3	1	1	F	3	504	Y	9235	
7	9/3	1	7	M	6				
7	9/3	2	S1	F	4/5	500	Y	9236	
7	9/3	2	S1	M	3	520	Y	9237	
7	9/3	2	S1	M	3	475	Y	9238	
7	9/3	2	S1	F	3	515	Y	9239	
7	9/3	2	S1	M	3	519	Y	9240	
7	9/3	2	S1	M	3	547	Y	9241	
7	9/3	2	S1	F	3	583	Y	9242	
7	9/3	2	S1	M	3	595	Y	9243	
7	9/3	2	S1	M	3	485	Y	9246	
7	9/3	2	S1	M	3	480	Y	9247	
7	9/3	2	S1	M	3	507	Y	9248	
7	9/3	2	S1	F	4	468	Y	9249	
7	9/3	2	S1	F	3	496	Y	9250	
7	9/3	2	S1	F	4	490	Y		9225
7	9/3	2	S1	M	3/5	540	Y	9251	
7	9/3	2	S1	F	3	460	Y	9252	
7	9/3	2	S1	M	3	548	Y	9255	
7	9/3	2	S1	M	3	558	Y	9256	
7	9/3	2	S1	M	3	573	Y	9258	
7	9/3	2	S1	M	3	497	Y	9259	
7	9/3	2	S1	F	3	508	Y	9260	
7	9/3	2	S1	M	3	555	Y	9261	
7	9/3	2	S3	M	3	475	Y	9262	
7	9/3	2	S3	M	3	512	Y	9264	
7	9/3	2	S3	F	4	539	Y	9265	
8	9/8	2	S1	M	3/5	530	Y	9266	
8	9/8	2	S1	M	3	515	Y	9267	
8	9/8	2	S1	F	4	515	Y	9268	
8	9/8	2	S1	F	4	533	Y	9269	
8	9/8	2	S1	F	4	505	Y	9270	
8	9/8	2	S1	M	3	480	Y	9271	

APPENDIX A-1. PINK SALMON CATCH RECORDS Page 4

WEEK	DAY	METHOD	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
8	9/8	2	S1	F	4/5	525	Y	9272	
8	9/8	2	S1	M	3	493	Y	9273	
8	9/8	2	S1	M	3	510	Y	9274	
8	9/8	2	S1	F	4	485	Y	9275	
8	9/8	2	S1	M	3	500	Y	9277	
8	9/8	2	S1	F	4	495	Y	9278	
8	9/8	2	S1	M	5	450			
8	9/8	2	S1	M	3	570	Y	9279	
8	9/8	2	S1	M	3	480	Y	9280	
8	9/8	2	S1	M	3/5	562	Y	9281	
8	9/8	2	S1	M	3/5	512	Y	9283	
8	9/8	2	S1	M	3/5	561	Y	9284	
8	9/8	2	S1	F	3	532	Y	9286	
8	9/8	2	S1	F	4/5	443	Y	9287	
8	9/8	2	S1	F	3	521	Y	9288	
8	9/8	2	S1	M	3/5	530	Y	9289	LT
8	9/8	2	S1	M	3/5	541	Y		9255
8	9/8	2	S1	M	3	473	Y	9290	
8	9/8	2	S1	M	3/5	508	Y		9204
8	9/8	2	S1	F	3	521	Y	9291	
8	9/8	2	S1	F	4/5	510	Y	9292	
8	9/8	2	S1	F	4	518	Y	9293	
8	9/8	2	S1	M	3/5	266	Y	9294	
8	9/8	2	S1	F	3/5	510	Y	9295	
8	9/8	2	S1	F	3	460	Y	9296	
8	9/8	2	S3	M	5	530			
8	9/8	1	1	F	4/5	450	Y	9297	
8	9/8	1	1	F	4	510	Y	9298	
8	9/8	1	1	M	3	450	Y	9299	
8	9/8	1	1	M	3	518	Y	9300	
8	9/8	1	1	F	4	506	Y		9268
8	9/8	1	1	M	3	495	Y	9301	
8	9/8	1	1	M	3/5	562	Y	9302	
8	9/8	1	1	M	3	534	Y	9303	
8	9/8	1	1	M	3	477	Y	9304	
8	9/8	1	1	M	3	495	Y	9305	
8	9/8	1	5	M	3/5	425			
8	9/8	1	5	F	2	510	Y	9306	
8	9/8	1	4	F	2	500	Y	9307	
8	9/9	1	6	F	3	558	Y	9308	
8	9/9	1	1	M	3/5	480	Y	9309	
8	9/9	1	1	M	3/5	519	Y	9310	
8	9/9	1	1	F	3	492	Y	9312	
8	9/9	1	1	M	5	440			LT
8	9/9	1	1	M	6	460			
8	9/9	1	1	M	6	508	Y		9274
8	9/9	1	1	F	3	491	Y		9278
8	9/9	1	5	F	3	510	Y		9298
8	9/9	1	5	F	5	465			
8	9/9	1	5	M	3	535	Y	9311	
8	9/9	1	5	M	5	525	Y	9313	
8	9/9	1	5	M	6	495			
8	9/9	1	7	M	6	470	Y		9271

WEEK	DAY	METHOD	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
8	9/9	1	4	M	6	424			
8	9/9	1	1	M	5	538	Y		9266
8	9/9	1	1	M	3	532	Y		9311
8	9/9	1	5	M	5	475			

APPENDIX A-2. CHUM SALMON CATCH RECORDS Page 1

WEEK	DAY	METHOD	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
1	7/21	1	6	m	3	620	B	574	
1	7/22	1	6	M	3	620	B		574
1	7/22	1	1	F	2	625	B	575	
1	7/22	1	5	M	3	709	B	576	
1	7/22	1	6	M	3	614	B		574
1	7/22	1	7	M	3	603	B	577	
1	7/23	1	7	M	3		B		577
2	7/28	1	6	M	3	554	B	579	
2	7/28	1	4	F	3	622	B	580	
2	7/29	1	6	F	3	603	B	581	
2	7/29	1	3	M	3	634	B	583	
2	7/29	1	4	F	3	442	B	585	
2	7/29	1	4	M	3	632	B	586	
2	7/29	1	6	F	3	625	B	587	
2	7/29	1	6	M	3	650	B	588	
2	7/29	1	6	M	1	555	B	589	
2	7/30	1	1	M	4/5	610	B	590	
2	7/30	1	7	M	3	580	B	592	
3	8/4	2	S1	F	4/5	587	B	595	
3	8/4	2	S1	F	3/5	604	B	596	
3	8/4	1	5	F	3	600	B	598	
3	8/4	1	5	M	3	573	B		592
3	8/5	1	5	M	3	614	B	599	
3	8/5	1	7	F	3	607	B	607	
3	8/5	1	7	M	3	632	B		586
3	8/5	1	7	F	3	600	B		598
3	8/5	1	6	F	3	555	B		589
3	8/5	1	6	M	3	631	B		586
3	8/6	1	6	M	3	580	B		592
3	8/6	1	6	F	4	650	B	611	
3	8/6	1	1	M	3	631	B		586
3	8/6	1	7	F	2	600	B	615	
4	8/12	1	4	F	3	577	B	636	
5	8/19	1	7	M	3	588	B	664	

APPENDIX A-3. COHO SALMON CATCH RECORDS Page 1

WEEK	DAY	METHOD	SITE#	SEX	COND	LENGTH	TAG COL.	TAG#	RECAP#
2	7/30	1	7	M	2	615	B	591	
4	8/11	1	4	M	1	610	B	623	
4	8/12	1	7	M	2	534	B	628	
4	8/12	1	7	F	1	580	B	629	
4	8/12	1	4	F	1	520	B	632	
4	8/13	1	7	F	1	676	B	642	
4	8/13	1	7	F	1	426	B	643	
4	8/13	1	7	M	2	630	B	644	
4	8/13	1	4	F	1	616	B	647	
5	8/18	2	S3	F	1	656	B	648	
5	8/19	1	3	M	2	635	B	662	
5	8/20	1	4	?	1	505	B	673	
6	8/25	2	S3	?	1	698	B	675	
6	8/25	1	4	M	1	360	B	677	
6	8/26	1	4	F	1	648	B	686	
6	8/27	1	7	M	3	560	B	689	
6	8/27	1	7	M	1	650	B	690	
6	8/27	1	4	M	2	625	B	691	
6	8/27	1	4	M	1	410	B	692	
7	9/2	1	5	F	2	638	B	697	
7	9/3	1	1	F	2	637	B	701	
7	9/3	1	3	M	3	612	B	705	
8	9/8	2	S3	M	2	684	B	707	
8	9/8	2	S3	M	1	698	B	708	
8	9/8	2	S3	M	1	705	B	709	
8	9/8	1	1	M	3	742	B	710	
8	9/8	1	6	M	3	673	B	711	
8	9/8	1	3	M	3	755	B	714	
8	9/9	1	4	M	2	675	B	716	
8	9/9	1	3	M	3	463	B	718	

APPENDIX A-4. SOCKEYE SALMON CATCH RECORDS Page 1

WEEK	DAY	METHOD	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
2	7/29	1	6	M	3	529	B	582	
2	7/29	1	7	M	3	543	B	584	
2	7/30	1	7	M	2	615	B	591	
2	7/30	1	7	M	3	520	B	592	
2	7/30	1	4	M	2	542	B	594	
2	7/30	1	4	F	2	LOST			
3	8/4	1	6	M	3	526	B	597	
3	8/5	1	5	M	3	538	B	600	
3	8/5	1	5	M	3	552	B	601	
3	8/5	1	3	M	3	559	B	612	
3	8/5	1	7	M	3	355	B	603	
3	8/5	1	7	M	2	431	B	604	
3	8/5	1	7	F	2	502	B	605	
3	8/5	1	7	M	3	535	B	606	
3	8/5	1	7	F	2	536	B	608	
3	8/5	1	7	F	2	532	B	609	
3	8/5	1	7	M	3	506	B	610	
3	8/6	1	6	M	3	536	B		608
3	8/6	1	7	M	3	540	B	613	
3	8/6	1	7	F	3	525	B	614	
3	8/6	1	7	M	6	515			
4	8/11	2	S1	F	3	525	B	617	
4	8/11	2	S3	F	2	546	B	616	
4	8/11	1	6	F	2	540	B	618	
4	8/11	1	5	M	3	565	B		579
4	8/11	1	5	M	3	563	B	619	
4	8/11	1	7	M	3	500	B	620	
4	8/11	1	7	M	3	532	B	621	
4	8/11	1	4	F	2	508	B	622	
4	8/11	1	4	M	3	544	B	624	
4	8/11	1	4	F	2	586	B	625	
4	8/12	1	6	M	3	335	B	626	
4	8/12	1	5	?	1	340	B	627	
4	8/12	1	3	M	3	542	B		624
4	8/12	1	7	F	6				
4	8/12	1	4	M	3	515	B	630	
4	8/12	1	4	M	3	519	B	631	
4	8/12	1	4	F	3	510	B	633	
4	8/12	1	4	F	2	476	B	634	
4	8/12	1	4		6				
4	8/12	1	6	?	1	461	B	635	
4	8/13	1	6	M	3	560	B	637	
4	8/13	1	6	F	2	560	B	638	
4	8/13	1	6	F	2	518	B	639	
4	8/13	1	3	?	1	348	B	640	
4	8/13	1	3	M	3	515	B		630
4	8/13	1	7	M	3	521	B	641	
4	8/13	1	4	M	3	519	B		631
4	8/13	1	4	F	2	534	B	645	
4	8/13	1	4	M	2	565	B	646	
5	8/18	2	S3	F	3	497	B	649	
5	8/18	1	6	M	3	577	B	650	
5	8/18	1	6	M	3	561	B	651	
5	8/18	1	6	F	3	519	B	652	
5	8/18	1	6	F	3	518	B	653	
5	8/18	1	5	F	3	492	B	654	
5	8/19	1	6	M	3	565	B	655	
5	8/19	1	6	F	3	525	B	656	
5	8/19	1	1	M	3	535	B	657	

APPENDIX A-4. SOCKEYE SALMON CATCH RECORDS Page 2

WEEK	DAY	METHOD	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
5	8/19	1	1	M	3	540	B	658	
5	8/19	1	1	M	3	550	B	659	
5	8/19	1	1	M	3	399	B	660	
5	8/19	1	1	F	3	462	B	661	
5	8/19	1	3	M	3	510	B	663	
5	8/19	1	4	F	3	516	B	653	
5	8/19	1	6	M	3	425	B		604
5	8/19	1	5	F	3	535	B	665	
5	8/19	1	5	M	3	410	B	666	
5	8/20	1	6	F	3	521	B		653
5	8/20	1	6	M	6				
5	8/20	1	1	M	3	494	B	667	
5	8/20	1	1	M	3	529	B	668	
5	8/20	1	1	M	3	415	B	669	
5	8/20	1	1	M	2	535	B	670	
5	8/20	1	1	M	3	390	B	671	
5	8/20	1	1	M	3	523	B	672	
5	8/20	1	4	M	2	620	B	674	
6	8/25	1	6	M	3	538	B		584
6	8/25	1	4	M	1	350	B	676	
6	8/26	1	6	M	3	650	B	678	
6	8/26	1	5		6		B		601
6	8/26	1	5	M	3	536	B	681	
6	8/26	1	7	M	4/5	490	B	682	
6	8/26	1	4	M	4	560	B	683	
6	8/26	1	6	M	3	545	B	684	
6	8/26	1	6	M	3	475	Y	9226	
6	8/27	1	6	M	3	406	B	687	
6	8/27	1	1	M	3	538	B		584
6	8/27	1	1	F	3	495	B	688	
7	9/1	1	6	F	3	570	B	693	
7	9/1	1	6	F	3	520	B	694	
7	9/1	1	6	M	3	450	B	695	
7	9/1	1	3	M	3	509	B		672
7	9/2	1	6	M	6	320			
7	9/2	1	6	M	2	335	B	696	
7	9/2	1	1	F	3/5	495	B		688
7	9/3	1	1	M	3	400	B	698	
7	9/3	1	1	M	3	534	B	699	
7	9/3	1	1	M	2	344	B	700	
7	9/3	1	3	M	3	618	B	703	
7	9/3	1	1	M	3	602	B	706	
7	9/3	1	1	M	4/5	610	B		591
8	9/8	1	1	M	3	680	B	712	
8	9/8	1	1	F	3	516	B	713	
8	9/9	1	1	M	3	360	B	715	
8	9/9	1	7	M	6		B		672
8	9/9	1	4	M	3	548	B	717	

APPENDIX A-5. CHINOOK SALMON CATCH RECORDS Page 1

WEEK	DAY	METHO	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
1	7/21	1	1	M	3	960	Y	9001	
1	7/21	1	1	M	3	675	Y	9002	
1	7/21	1	1	M	3	700	Y	9003	
1	7/21	1	1	M	3	400	Y	9004	
1	7/21	1	4	M	4	1010	Y	9005	
1	7/21	1	4	M	3	850	Y	9007	
1	7/21	1	4	M	3	920	Y	9008	
1	7/21	1	4	M	3	660	Y	9009	
1	7/21	1	4	M	3	610	Y	9010	
1	7/21	1	1	M	3	830	Y	9011	
1	7/21	1	5	M	3	740	Y	9012	
1	7/21	1	7	M	3	740	Y	9013	
1	7/21	1	7	M	3	910	Y		9008
1	7/21	1	7	M	3	644	Y	9014	
1	7/21	1	7	M	3	707	Y	9015	
1	7/21	1	7	M	3	650	Y	9016	
1	7/21	1	4	M	3	682	Y	9017	
1	7/21	1	4	M	3	750	Y	9019	
1	7/22	1	6	M	3	690	Y	9021	
1	7/22	1	1	M	3	754	Y	9022	
1	7/22	1	1	M	3	781	Y	9023	
1	7/22	1	1	M	3	706	Y	9024	
1	7/22	1	1	F	3	862	Y	9025	
1	7/22	1	1	M	3	759	Y	9027	
1	7/22	1	1	M	3	646	Y	9028	
1	7/22	1	3	F	3	865	Y	9030	
1	7/22	1	3	M	3	735	Y	9031	
1	7/22	1	3	M	3	720	Y	9033	
1	7/22	1	7	M	3	932	Y	9035	
1	7/22	1	7	F	4	782	Y	9036	
1	7/22	1	7	M	3	749	Y	9037	
1	7/22	1	7	M	3	951	Y	9038	
1	7/22	1	7	M	3	734	Y	9039	
1	7/22	1	7	M	3	915	Y	9040	
1	7/22	1	7	M	3	953	Y	9041	
1	7/22	1	7	F	3	838	Y	9043	
1	7/22	1	7	M	3	857	Y	9042	
1	7/22	1	7	F	3	869	Y	9044	
1	7/22	1	7	M	3	766	Y	9045	
1	7/22	1	4	M	3	687	Y	9047	
1	7/22	1	4	M	4	1000	Y	9049	
1	7/22	1	4	M	3	715	Y	9051	
1	7/22	1	4	M	3	954	Y	9052	
1	7/22	1	4	M	3	736	Y	9053	
1	7/22	1	4	M	3	740	Y	9055	
1	7/22	1	4	M	3	743	Y	9062	
1	7/22	1	4	M	3	737	Y	9063	
1	7/22	1	4	M	3	672	Y	9064	
1	7/22	1	4	M	3	353	Y	9065	
1	7/22	1	4	M	3	454	Y	9066	
1	7/22	1	1	M	3	727	Y	9067	
1	7/22	1	1	M	3	761	Y	9072	
1	7/22	1	7	M	2	418	Y	9073	
1	7/22	1	4	M	3	411	Y	9074	
1	7/22	1	4	M	3	779	Y	9075	
1	7/22	1	4	M	3	752	Y	9076	
1	7/22	1	4	M	3	934	Y	9077	
1	7/22	1	4	M	3	642	Y	9078	
1	7/22	1	4	M	3	736	Y	9079	

WEEK	DAY	METHO	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
1	7/23	1	6	M	3	676	Y	9080	
1	7/23	1	6	M	3	642	Y	9081	
1	7/23	1	6	F	3	959	Y	9082	
1	7/23	1	1	M	3	860	Y	9083	
1	7/23	1	1	M	3	697	Y	9084	
1	7/23	1	5	F	4	883	Y	9085	
1	7/23	1	7	M	3	750	Y	9086	
1	7/23	1	7	M	3	937	Y	9087	
1	7/23	1	7	F	3	956	Y	9088	
1	7/23	1	7	M	3	711	Y	9089	
1	7/23	1	7	M	3	744	Y	9090	
1	7/23	1	7	M	3	827	Y	9091	
1	7/23	1	7	M	3	970	Y	9092	
1	7/23	1	7	F	4	955	Y	9093	
1	7/23	1	7	M	3	664	Y	9094	
1	7/23	1	7	M	3	726	Y	9095	
1	7/23	1	4	M	3	686	Y	9097	
1	7/23	1	4	M	3	736	Y	9098	
2	7/28	1	1	M	3	958	Y	9102	
2	7/28	1	1	M	3	704	Y	9104	
2	7/28	1	7	F	4	697	Y	9106	
2	7/29	1	6	M	3	950	Y	9111	
2	7/29	1	1	M	3	643	Y	9112	
2	7/29	1	7	M	3	730	Y	9114	
2	7/29	1	7	F	2	727	Y	9115	
2	7/29	1	7	M	3	698	Y		9106
2	7/29	1	7	M	3	734	Y	9116	
2	7/29	1	4	M	3	649	Y	9119	
2	7/30	1	6	M	4	1000	Y	9120	
2	7/30	1	6	M	4	695	Y		9106
2	7/30	1	1	M	3	729	Y	9121	
2	7/30	1	4	M	3	726	Y	9123	
3	8/4	2	S3	F	4/5	835	Y	9134	
3	8/4	1	6	M	4/5	1110	Y	9144	
3	8/4	1	4	F	4/5	850			
3	8/5	1	5	M	3/5	673	Y	9146	
3	8/5	1	7	M	3	722	Y	9147	
3	8/5	1	4	M	3/5	972	Y	9151	
3	8/5	1	4	M	2	1020	Y	9152	
3	8/5	1	4	M	3	359	Y	9153	
3	8/5	1	4	M	3	375	Y	9155	
3	8/5	1	6	M	3	399	Y	9157	
3	8/5	1	6	M	3	850	Y	9158	
3	8/5	1	1	M	4/5	720	Y	9159	
3	8/5	1	1	M	3/5	340	Y	9160	
3	8/5	1	1	F	4/5	680	Y	9161	
3	8/5	1	3	M	4/5	717	Y	9162	
3	8/5	1	7	M	3	695	Y	9164	
3	8/5	1	4	M	3	760	Y	9167	
4	8/11	1	1	M	4	740	Y	9169	
4	8/12	1	7	M	4/5	767	Y	9170	
4	8/12	1	4	M	3	432	Y	9172	
5	8/18	2	S3	M	3	810	Y	9193	
5	8/19	1	1	M	3/5	730	Y	9196	
5	8/19	1	3	M	3/5	410	Y	9199	
5	8/19	1	7	M	3/5	410	Y		9199
6	8/26	1	6	M	3	700	Y	9224	
6	8/27	1	4	M	3	405	Y	9232	
8	9/8	1	3	M	3	254			

APPENDIX A-6. DOLLY VARDEN CATCH RECORDS Page 1

WEEK	DAY	METHOD	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
1	7/21	1	1			330		TP	
1	7/21	1	1			300		TP	
1	7/21	1	1			400		TP	
1	7/22	1	5			270		TP	
1	7/22	1	7			337		TP	
1	7/22	1	7			299		TP	
1	7/22	1	1			285		TP	
1	7/23	1	1			336		TP	
1	7/23	1	1			313		TP	
1	7/23	1	5			383		TP	
1	7/23	1	5			331		TP	
1	7/23	1	3			282		TP	
1	7/23	1	3		6	305		TP	
2	7/28	1	1			335		TP	
2	7/28	1	5			291		TP	
2	7/28	1	6			285		TP	
2	7/28	1	6			300			TP
2	7/28	1	1			310		TP	
2	7/28	1	1			283		TP	
2	7/28	1	5			LOST		TP	
2	7/29	1	1		6	296		TP	
2	7/29	1	3			264		TP	
2	7/29	1	3			293		TP	
2	7/29	1	4			288		TP	
2	7/29	1	4			287		TP	
2	7/29	1	4			310		TP	
2	7/29	1	5			282		TP	
2	7/29	1	3			292		TP	
2	7/29	1	4			288		TP	
2	7/30	1	6			302		TP	
2	7/30	1	1			282			TP
2	7/30	1	1			353		TP	
2	7/30	1	5			298		TP	
2	7/30	1	5			282		TP	
2	7/30	1	3			292		TP	
2	7/30	1	3			280		TP	
2	7/30	1	3			310		TP	
2	7/30	1	3			293		TP	
2	7/30	1	7			263		TP	
2	7/30	1	4			241		TP	
3	8/4	2	S1			278		TP	
3	8/4	2	S1			315		TP	
3	8/4	2	S3			292		TP	
3	8/4	2	S3			344		TP	
3	8/4	2	S3			292		TP	
3	8/4	2	S3			344			TP
3	8/4	1	4			282		TP	
3	8/5	1	3		6	274		TP	

APPENDIX A-6. DOLLY VARDEN CATCH RECORDS Page 2

WEEK	DAY	METHOD	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
3	8/5	1	7			284		TP	
3	8/5	1	7			293			TP
3	8/5	1	4		6	260		TP	
3	8/5	1	4		6	250		TP	
3	8/5	1	5			256		TP	
3	8/5	1	5			325		TP	
3	8/5	1	3			426		TP	
3	8/5	1	4			270		TP	
3	8/6	1	6			318		TP	
3	8/6	1	6		6	305		TP	
3	8/6	1	1			310		TP	
3	8/6	1	1			286		TP	
3	8/6	1	1			260		TP	
3	8/6	1	5			325		TP	
3	8/6	1	5			276		TP	
4	8/11	2	S1			344		TP	
4	8/11	2	S1			292		TP	
4	8/11	2	S1			311		TP	
4	8/11	2	S1			296		TP	
4	8/11	2	S1			262			TP
4	8/11	2	S1			262			TP
4	8/11	1	6			340			TP
4	8/11	1	1			297		TP	
4	8/11	1	7			310		TP	
4	8/11	1	4			442		TP	
4	8/12	1	6			327			TP
4	8/12	1	6			340		TP	
4	8/12	1	3			343			TP
4	8/12	1	3			310		TP	
4	8/12	1	7			322		TP	
4	8/12	1	6			334		TP	
4	8/12	1	7			280		TP	
4	8/12	1	4			260		TP	
4	8/12	1	4			250		TP	
4	8/13	1	6			300		TP	
4	8/13	1	6			265		TP	
4	8/13	1	1			265		TP	
4	8/13	1	1			292			TP
4	8/13	1	5			268		TP	
4	8/13	1	5			272		TP	
5	8/18	2	S1			255		TP	
5	8/18	2	S1			284		TP	
5	8/19	1	6			323		TP	
5	8/19	1	3			285			TP
5	8/19	1	6			295		TP	
5	8/19	1	6			310		TP	
5	8/19	1	6			330		TP	
5	8/20	1	5			250		TP	
5	8/20	1	5			276		TP	

APPENDIX A-6. DOLLY VARDEN CATCH RECORDS Page 3

WEEK	DAY	METHOD	SITE#	SEX	COND.	LENGTH	TAG COL.	TAG#	RECAP#
5	8/20	1	6			348		TP	
5	8/20	1	1			270		TP	
6	8/25	2	S1			354		TP	
6	8/25	1	6			329		TP	
6	8/25	1	6			285		TP	
6	8/26	1	6			305		TP	
6	8/26	1	6			319		TP	
6	8/26	1	3			336		TP	
6	8/26	1	3			271		TP	
6	8/27	1	6			296		TP	
6	8/27	1	6			286		TP	
6	8/27	1	1			275		TP	
7	9/1	1	6			269			TP
7	9/2	1	6			276		TP	
7	9/2	1	6			325		TP	
7	9/2	1	6			300		TP	
7	9/3	1	6			297		TP	
7	9/3	1	1			288			TP
7	9/3	1	1			308		TP	
7	9/3	1	5			284		TP	
7	9/3	1	5			275		TP	
7	9/3	1	3			328			TP
8	9/8	2	S1			314		TP	
8	9/8	2	S3			272		TP	
8	9/8	1	6			380		TP	
8	9/8	1	5			265		TP	
8	9/9	1	6			285		TP	
8	9/9	1	1			314			TP
8	9/9	1	5		6	379			TP

APPENDIX B: TRAP NET FISHING EFFORT SUMMARY - 1998 BRADLEY RIVER

WEEK	NET	DATE/TIME SET	DATE/TIME PULLED	EFFORT (HRS)
1	1	07/21 08:45	07/23 08:25	47.7
	3	07/21 09:20	07/23 08:45	47.4
	4	07/21 10:10	07/23 09:10	47.0
	5A	07/21 09:05	07/23 08:35	47.5
	6A	07/21 08:20	07/23 08:15	47.9
	7A	07/21 09:50	07/23 08:50	47.0
2	1	07/28 08:47	07/30 08:39	47.9
	3	07/28 09:11	07/30 08:53	47.7
	4	07/28 09:27	07/30 09:32	48.1
	5A	07/28 09:01	07/30 08:49	47.8
	6A	07/28 08:37	07/30 08:25	47.8
	7A	07/28 09:20	07/30 09:18	48.0
3	1	08/04 08:37	08/06 08:45	48.1
	3	08/04 09:04	08/06 09:03	48.0
	4	08/04 09:21	08/06 09:25	48.1
	5A	08/04 08:46	08/06 08:55	48.1
	6A	08/04 08:26	08/06 08:26	48.0
	7A	08/04 09:15	08/06 09:15	48.0
4	1	08/11 08:41	08/13 08:40	48.0
	3	08/11 09:00	08/13 08:57	48.0
	4	08/11 09:14	08/13 09:21	48.1
	5A	08/11 08:52	08/13 08:48	47.9
	6A	08/11 08:30	08/13 08:28	48.0
	7A	08/11 09:07	08/13 09:08	48.0
5	1	08/18 13:19	08/20 12:53	47.6
	3	08/18 13:31	08/20 13:07	47.6
	4	08/18 13:48	08/20 13:21	47.5
	5A	08/18 13:26	08/20 13:00	47.6
	6A	08/18 13:08	08/20 12:44	47.6
	7A	08/18 13:42	08/20 13:12	47.5
6	1	08/25 08:32	08/27 08:36	48.1
	3	08/25 08:48	08/27 08:50	48.0
	4	08/25 09:02	08/27 09:11	48.2
	5A	08/25 08:41	08/27 08:46	48.1
	6A	08/25 08:23	08/27 08:24	48.0
	7A	08/25 08:55	08/27 09:04	48.2
7	1	09/01 13:15	09/03 12:10	46.9
	3	09/01 13:27	09/03 12:20	46.9
	4	09/01 13:45	09/03 09:00	41.3
	5A	09/01 13:20	09/03 12:15	46.9
	6A	09/01 13:00	09/03 12:00	47.0
	7A	09/02 09:00	09/03 12:30	29.5
8	1	09/08 08:28	09/10 08:25	48.0
	3	09/08 08:50	09/10 08:50	48.0
	4	09/08 09:01	09/10 09:15	48.2
	5A	09/08 08:44	09/10 08:40	47.9
	6A	09/08 08:20	09/10 08:10	47.8
	7A	09/08 08:55	09/10 09:00	48.1

APPENDIX C. PHYSICAL DATA

DATE	WATER TEMP. (C)	AIR TEMP. (C)	TURBIDITY (NTU)	STAFF GUAGE (FT.)
21-Jul	7	14	14	
22-Jul	9	14	22	1.3
23-Jul	8	12	41	1.3
28-Jul	8	11	54	1.2
29-Jul	8	9	61	1.2
30-Jul	9	10	54	1.2
4-Aug	9	13	45	1.2
5-Aug	9	12	58	1.3
6-Aug	9	12	46	1.2
11-Aug	3	4	58	1.2
12-Aug		4	70	1.2
13-Aug	8	3	69	1.2
19-Aug	6	0	74	1.2
20-Aug	8	11	69	1.2
25-Aug	7	6	72	1.3
26-Aug	6	3	70	1.3
27-Aug	6	2	74	1.3
2-Sep	4	1	4	2.0
3-Sep	4	6	2	1.5
8-Sep	5	-3	53	1.3
9-Sep	7	8	64	1.4
10-Sep	7	6	60	1.4